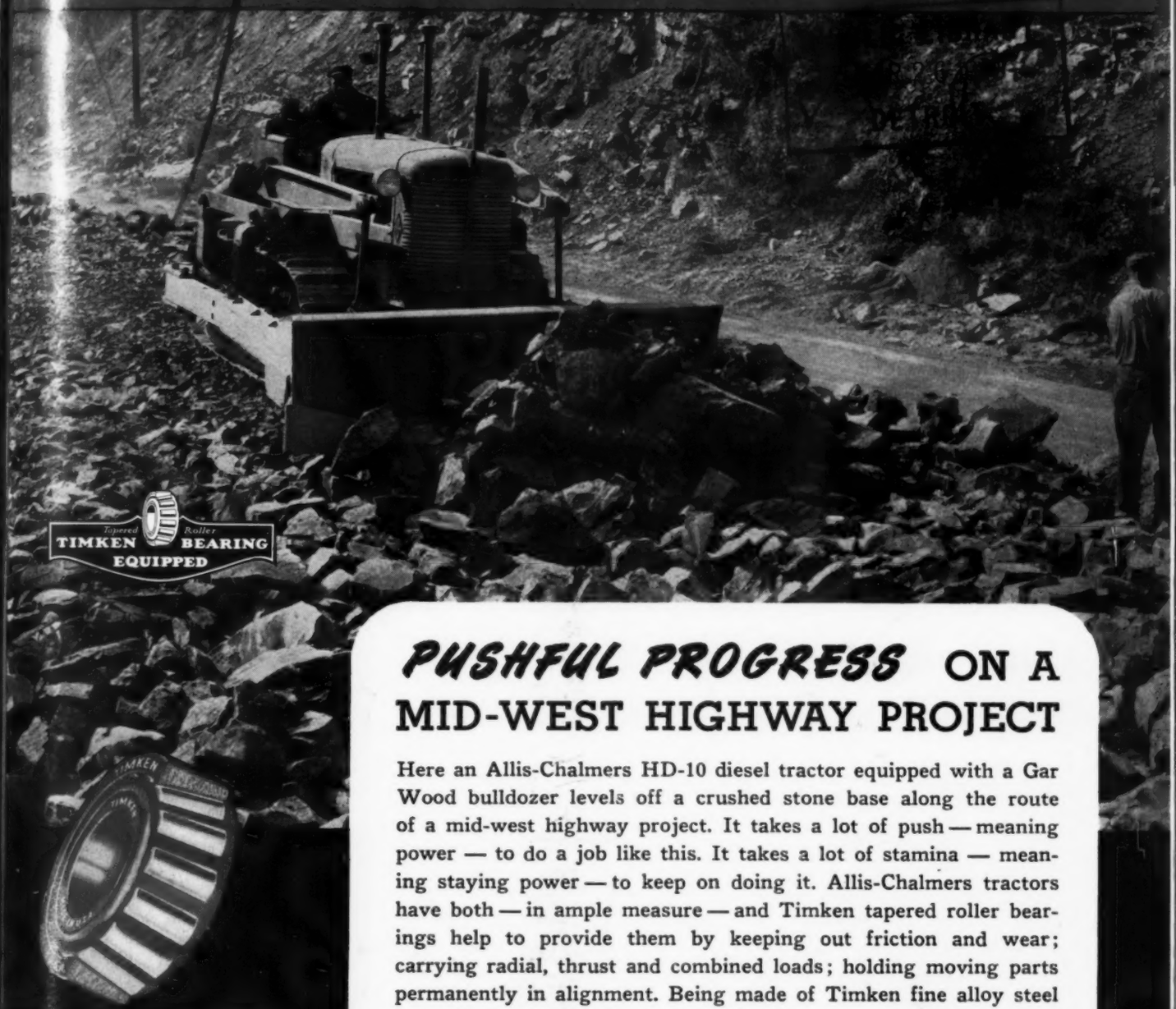
ROADS AND STREETS

MARCH 1949



PUSHFUL PROGRESS ON A MID-WEST HIGHWAY PROJECT

Here an Allis-Chalmers HD-10 diesel tractor equipped with a Gar Wood bulldozer levels off a crushed stone base along the route of a mid-west highway project. It takes a lot of push — meaning power — to do a job like this. It takes a lot of stamina — meaning staying power — to keep on doing it. Allis-Chalmers tractors have both — in ample measure — and Timken tapered roller bearings help to provide them by keeping out friction and wear; carrying radial, thrust and combined loads; holding moving parts permanently in alignment. Being made of Timken fine alloy steel researched, metallurgised and melted in our own plant. Timken bearings stand up and last — and last — and last. Best for leading tractor builders — best for you. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address "TIMROSCO".

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4-POINT POSITIVE DRIVE

SNOW FIGHTERS

Bethlehem Reinforcing Bars in bridge deck. Nearly 45 tons of reinforcing steel were used in this structure.

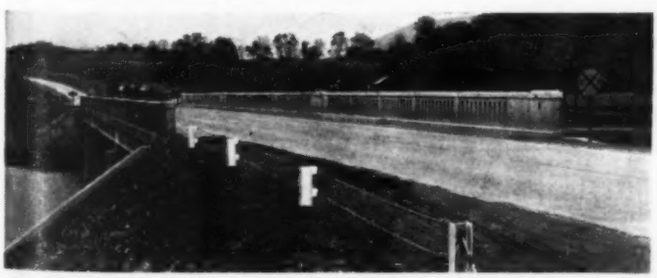
Straightening Out U.S. 220

Over she goes! Two men move Bethlehem Bar Mat into place over initial course.

An after-lunch chat. Left to right: Al Diehl and Joseph Schuessler, inspectors, both of Pennsylvania Department of Highways; Robert Rosser, contractor; and Emory Grove, foreman.

Inserting installing-cap over Bethlehem Dowel Unit. In finished lane this unit will function as contraction joint.

One of the many road-modernization projects undertaken in recent months by the Pennsylvania Department of Highways was a 4427-ft stretch of U. S. 220, located in the Cessna, Pa., area. The two-lane job included a bridge, and was handled by Rosser Construction Co., of Mt. Joy, Pa. Bridge reinforcing, bar mats, dowel units and cable guard rail were supplied by Bethlehem. Various phases of the construction are shown in the accompanying pictures.



Completed bridge ready for traffic. Bethlehem Cable Guard Rail, mounted on steel posts at bridge approaches, provides constant protection for motorists.

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ROADS AND STREETS

March, 1949 • Vol. 92 • No. 3

With Roads and Streets Have Been Combined Good Roads Magazine And Engineering & Contracting

In This Issue

Coming Articles

Beginning in May

New "Road Builders' at Work" series of Editorial Reports by the R & S editors. Each month a 12 to 16 page compilation of fresh data on some practical phase of construction, maintenance and operation. First subject: Roadway and Street Maintenance.

In April and May

Contractor Topics: "What Made This Contractor Tick" . . . Contractor costs in California discussed . . . Beginning a new batch of "fast job" summaries from the best-managed of 1948 grading and paving projects over the country . . . AGC annual convention report (Waldorf meeting).

Bridges: Deep Foundation Pile Methods on F. A. Secondary Bridge . . . Picture round-up of postwar bridge . . . A big eastern bridge story soon . . . Building an open spandrel arch.

Grading: 1,300,000 C. Y. per Month at Cherry Creek Dam . . . How to plan a balanced earthmoving fleet . . . Grading Pittsburgh's Airport Parkway.

Aggregate Production: How stone was produced on a Maine job . . . Also a Georgia Project where modern equipment paid off.

Maintenance: Utilizing the Contractor's Equipment on Winter Maintenance.

Snow Removal: Several methods and experience reports soon, from the Western "arctic" belt.

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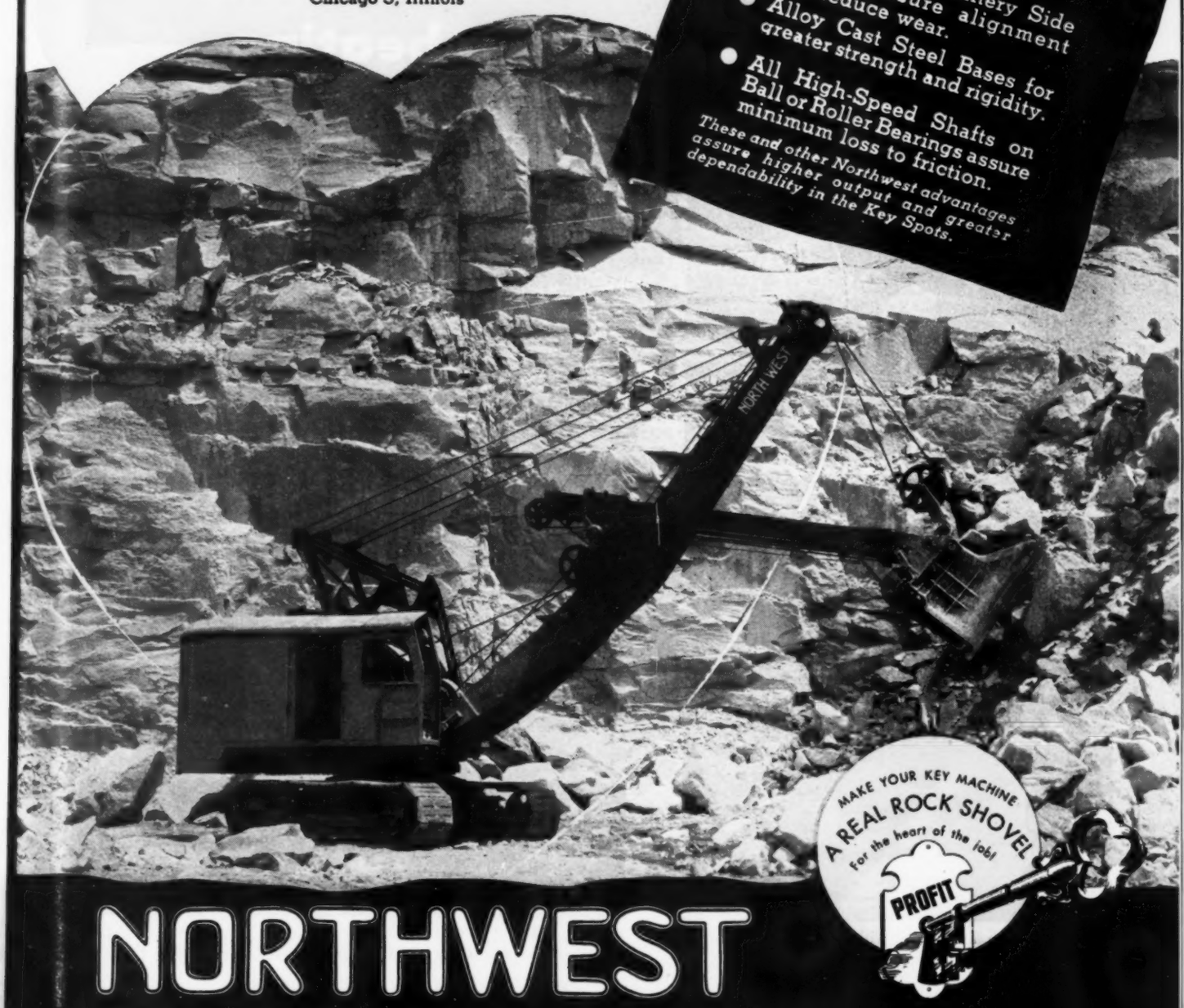

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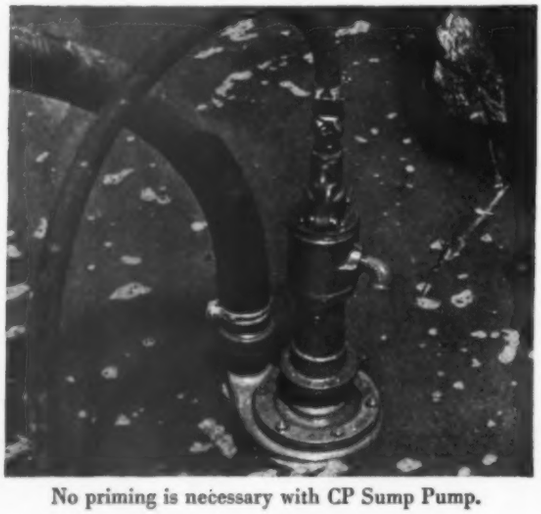

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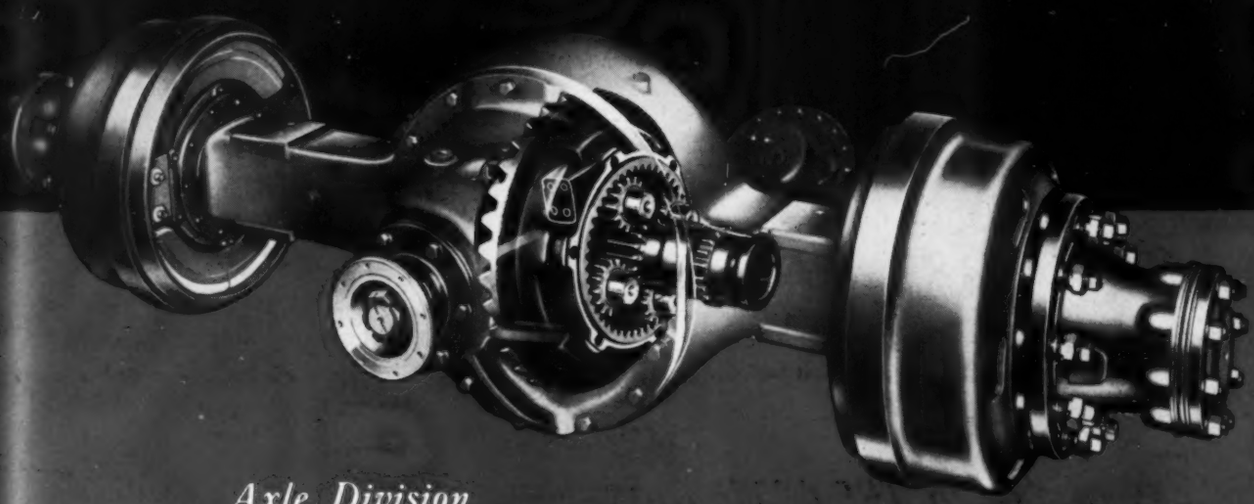

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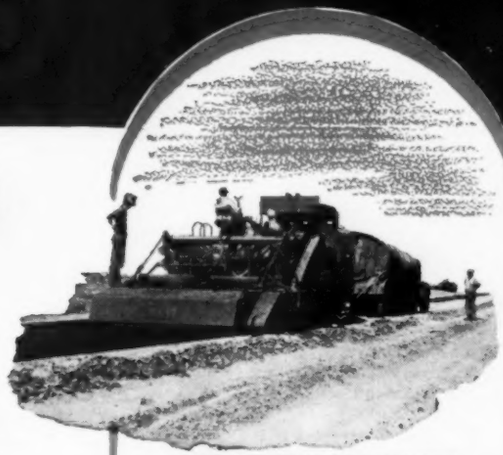

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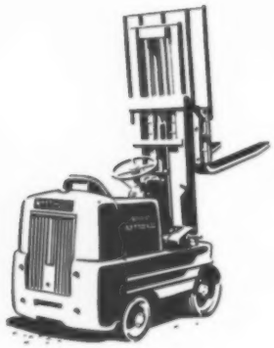

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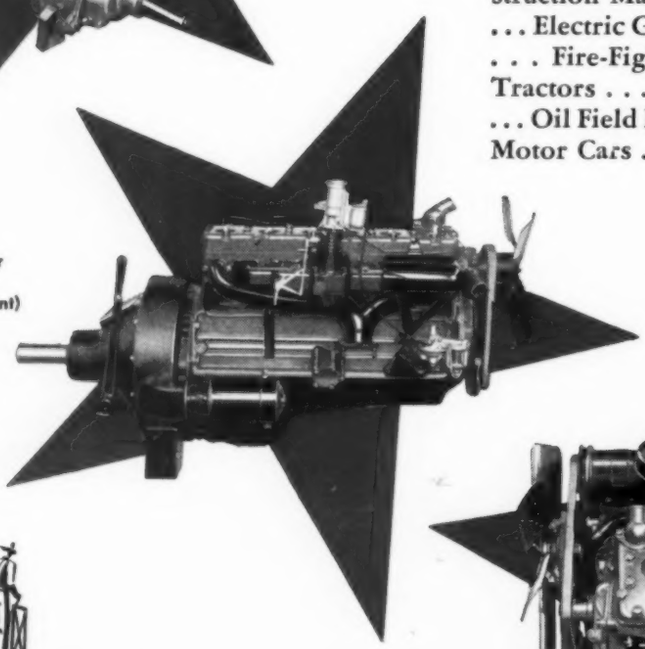

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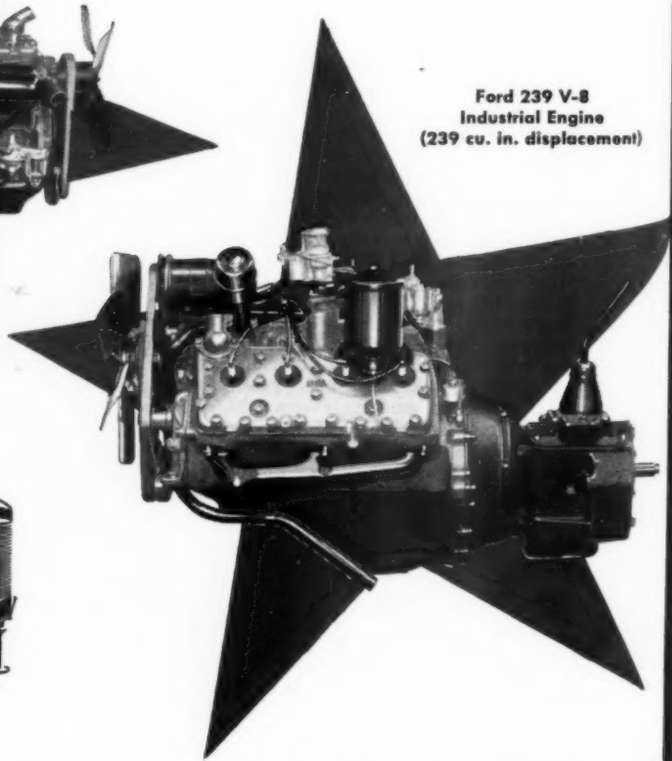

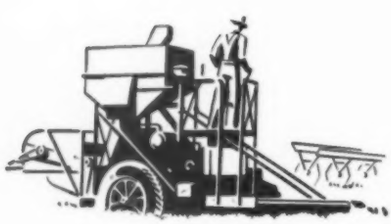

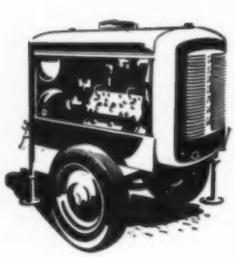

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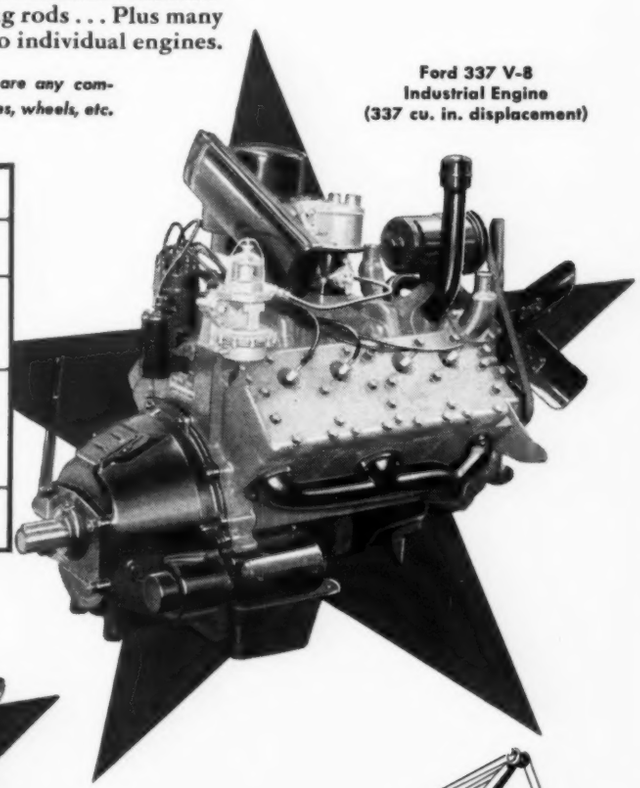
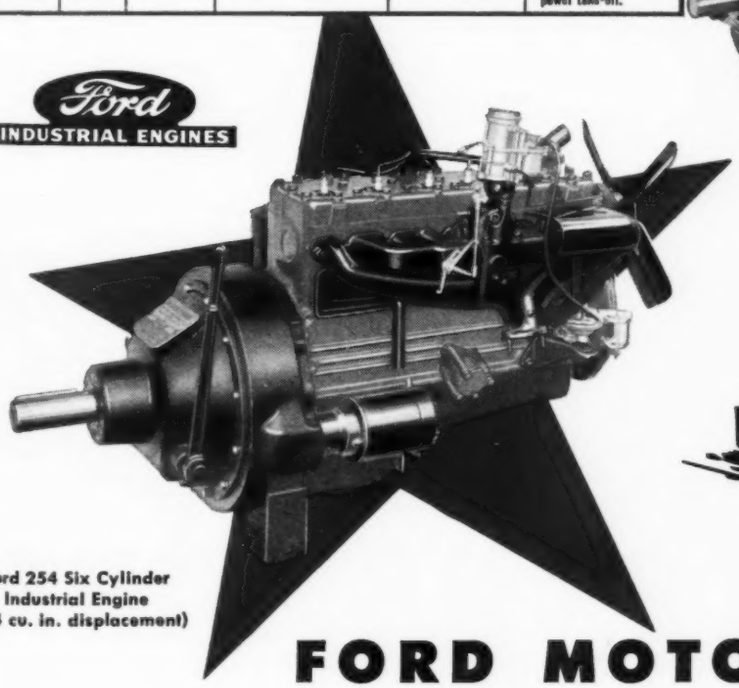
226	6	3.3x4.4	226	80 @ 2400	182#' @ 1200	Clutch; 3, 4 and 5 speed transmissions; SAE #3 and #4 housings; power take-off.
239	V-8	3 3/16 x 3 3/4	239	85 @ 2400	187#' @ 1600	
254	6	3.5x4.4	254	95 @ 2400	212#' @ 1200	
337	V-8	3 1/2 x 4 3/8	337	117 @ 2400	257#' @ 1600	Clutch; 5 speed transmission; direct drive power take-off.

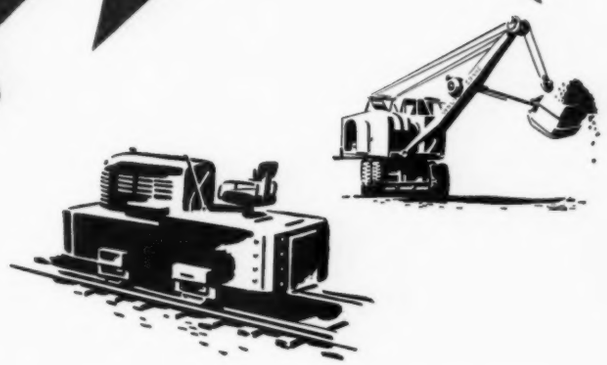
Ford 337 V-8 Industrial Engine (337 cu. in. displacement)



Ford INDUSTRIAL ENGINES



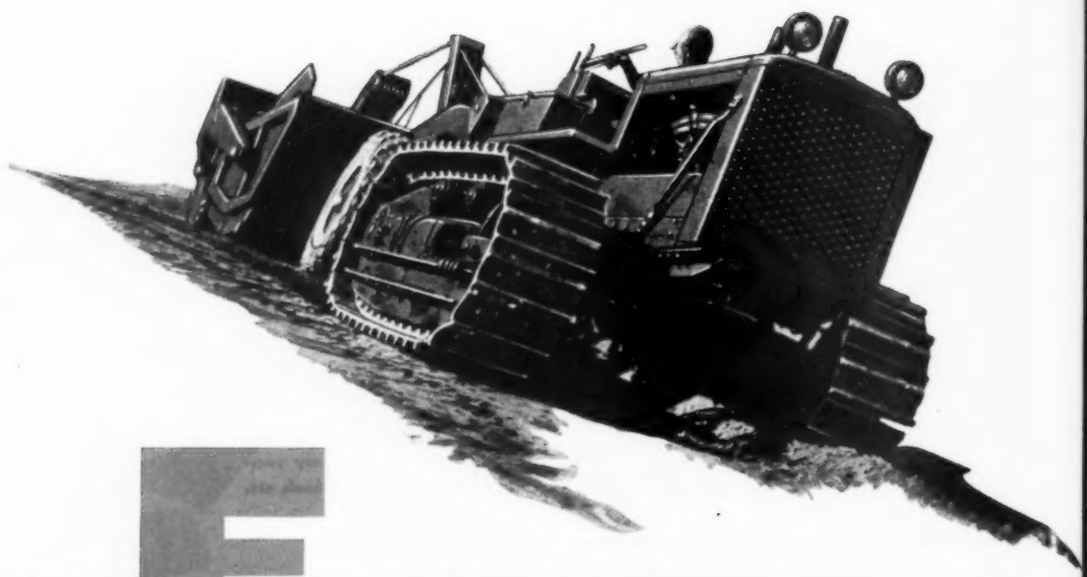
Ford 254 Six Cylinder Industrial Engine (254 cu. in. displacement)



FORD MOTOR COMPANY

INDUSTRIAL AND MARINE ENGINE SALES DEPARTMENT • DEARBORN, MICHIGAN

WHEN IT'S FORD-POWERED



THE ENGINE THAT MOVES THE EARTH

When you buy earthmoving power, you buy the tools of the construction trade —crawler or wheel tractors, motor graders, draglines and shovels. The one common denominator of all is the engine. It gives get up and go to the equipment. It is the power that moves the earth.

When you buy and use earthmoving equipment, you buy and use the power of engines to work for you!

When you specify INTERNATIONAL Power, you can be sure of getting your full money's worth of power and performance. Diesel—or gasoline—International Engines are designed to give you dependable and efficient power. And they're built to the most exacting standards of the industry.

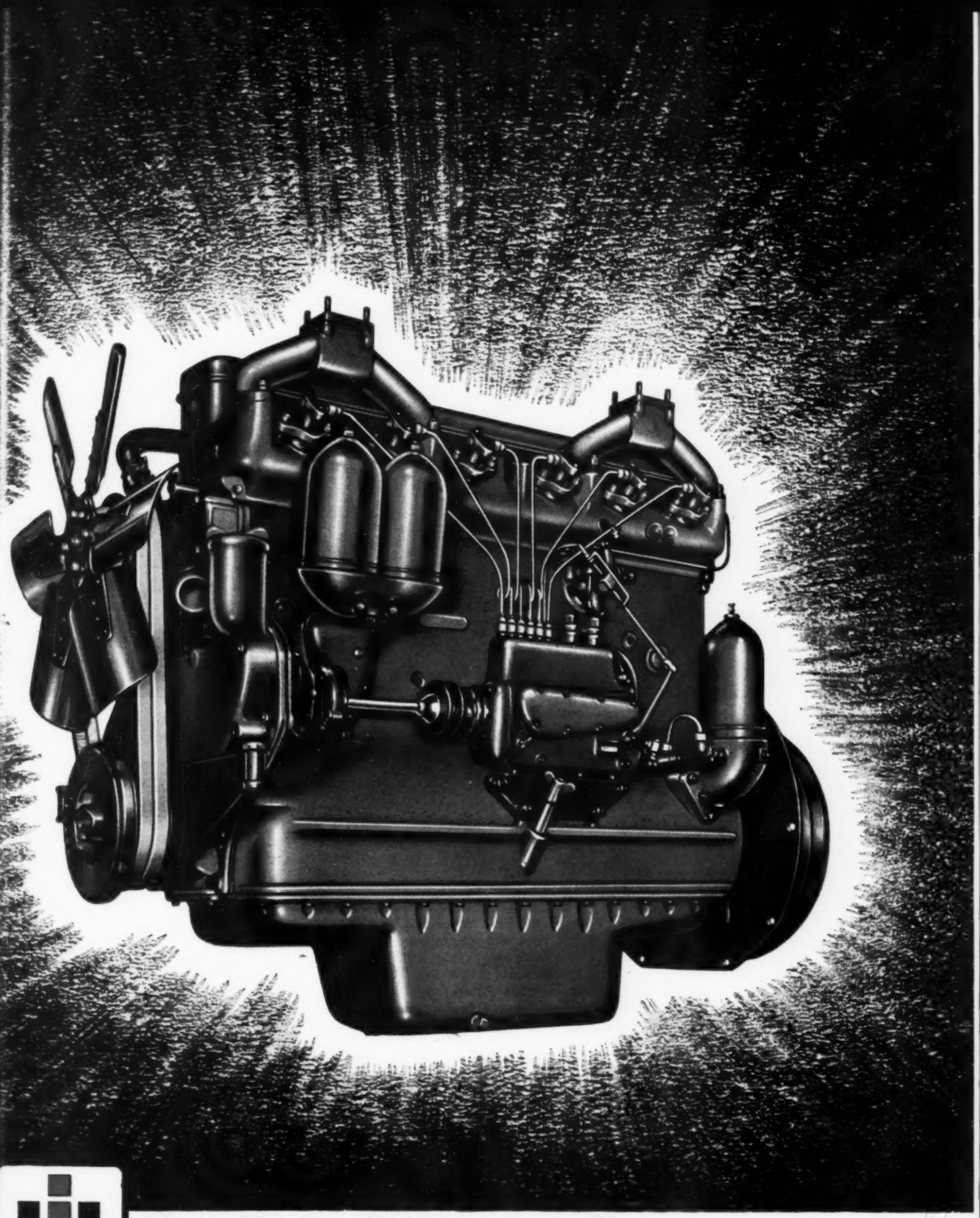
International full-Diesels give you features not found in any other Diesel. They provide in-built, gasoline-conversion star ing which gets International Diesel warmed up and on the job instantly. Th International designed and built fuel i jection system gives you unusually hig combustion efficiency and excellent fu economy. Rifle-drilled oil-pressure pa sages assure adequate lubrication for a working parts.

See your International Industrial Powe Distributor for the facts about these fe tures. Remember, he is equipped to giv you superb service on all International powered equipment which he sells . . . an other reason why your best buy in earth moving power is International.

INTERNATIONAL HARVESTER COMPAN
Chicago

CRAWLER TRACTORS
POWER UNITS
DIESEL ENGINES
WHEEL TRACTORS

INTERNATIONAL



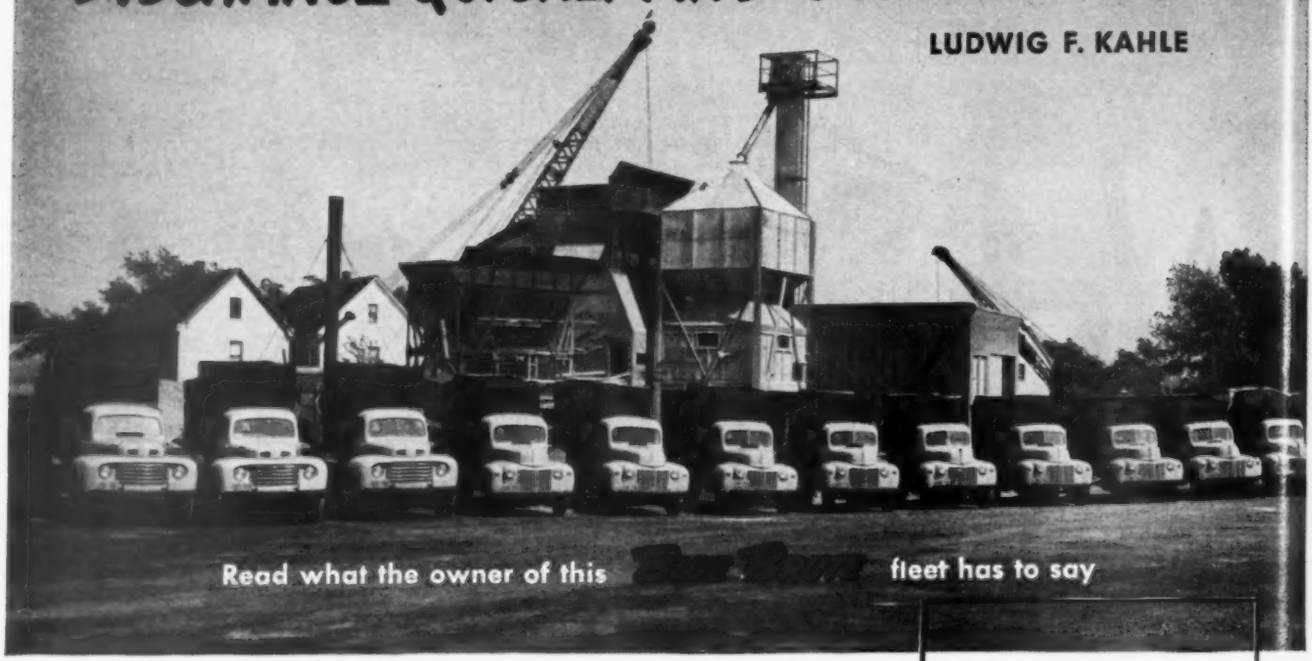
INTERNATIONAL HARVESTER

Listen to James Melton on "Harvest of Stars" every Wednesday evening—CBS

Industrial Power

"THEY CHARGE WELL, MIX THOROUGHLY, DISCHARGE QUICKLY AND COMPLETELY."

LUDWIG F. KAHLE



Read what the owner of this [redacted] fleet has to say

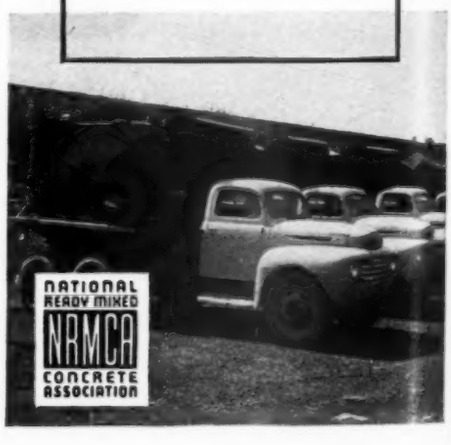
When a big-time ready-mix producer starts talking facts about equipment in which he has invested heavily — it's time to listen! For example, Mr. Ludwig F. Kahle, owner of the Pine Hill Concrete Mix, is well qualified to pass judgement on Blue Brute Hi-Up Truck Mixers. He purchased his first Hi-Up three years ago, and on the basis of this machine's performance has since expanded his fleet to twelve. Mr. Kahle writes:

"Our Hi-Up fleet has operated very satisfactorily. These mixers charge well, mix thoroughly and discharge quickly and completely. Other than ordinary wear we have had little mechanical trouble."

That's the performance story you hear over and over from Hi-Up owners. For the reasons why, just look over these outstanding Hi-Up features: Improved, non-jamming sealing door . . . trouble-free water system . . . clean simplicity of design, with easy accessibility . . . engineered flexibility that absorbs working strains . . . fast-charging hopper . . . and Ransome's exclusive blade action, unbeatable for thorough mixing and fast discharge — even at minimum slump!

Why not investigate thoroughly how Ransome Blue Brute Hi-Ups can save you time and money on every job — day after day, year after year? For further proof that *there's more worth in a Blue Brute,* see your nearby Worthington-Ransome Distributor, or write for Bulletin 221. R9-2

Massed Efficiency-Plus-Economy! The hard-working Ransome Blue Brute Hi-Up Truck Fleet of the Pine Hill Concrete Mix, outside the Company's plant in Buffalo, N. Y. Hi-Ups purchased through Murray Equipment Co., Buffalo.



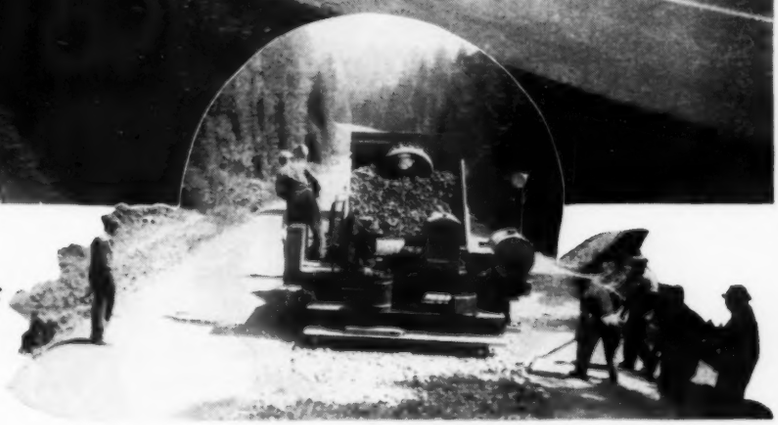
WORTHINGTON

WORTHINGTON PUMP AND MACHINERY CORPORATION
Construction Equipment Department, Harrison, New Jersey
Distributors in all principal cities

BUY BLUE BRUTES

IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

THESE MAY BE YOUR JOBS TOMORROW!



WHEN you buy a Black Top Paver remember if it is going to make money it must be kept busy. Look at these jobs!

The top one was a widening job with hot mix. Note the "feathered edge" at the right, which allowed rolling right into the old crown without worrying about excess. This is one of the advantages of the Adnun Cutter Bar adjustment and the Divided Hopper.

Look at the other job — handling trucks at 6500 ft. elevation and laying 2 to 4 in. rock on grades. These are just some of the advantages that make the Adnun a better buy — it has the versatility that permits you to fit it into a wide variety of work and keep it busy.

The Adnun will take the punishment of heavy work without constant rebuilding. It has the power to handle heavy trucks. Hydraulic controls make operation smooth and easy. It lays stone, cinder, clinker, sand, soil cement and hot or cold asphalt. Don't tie yourself up with a "one-job" machine. Ask for complete details.

THE FOOTE COMPANY, INC.

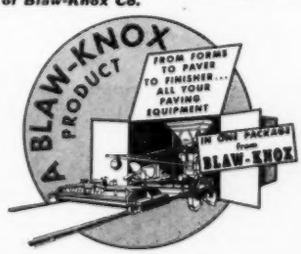
1936 State Street — Nunda, New York

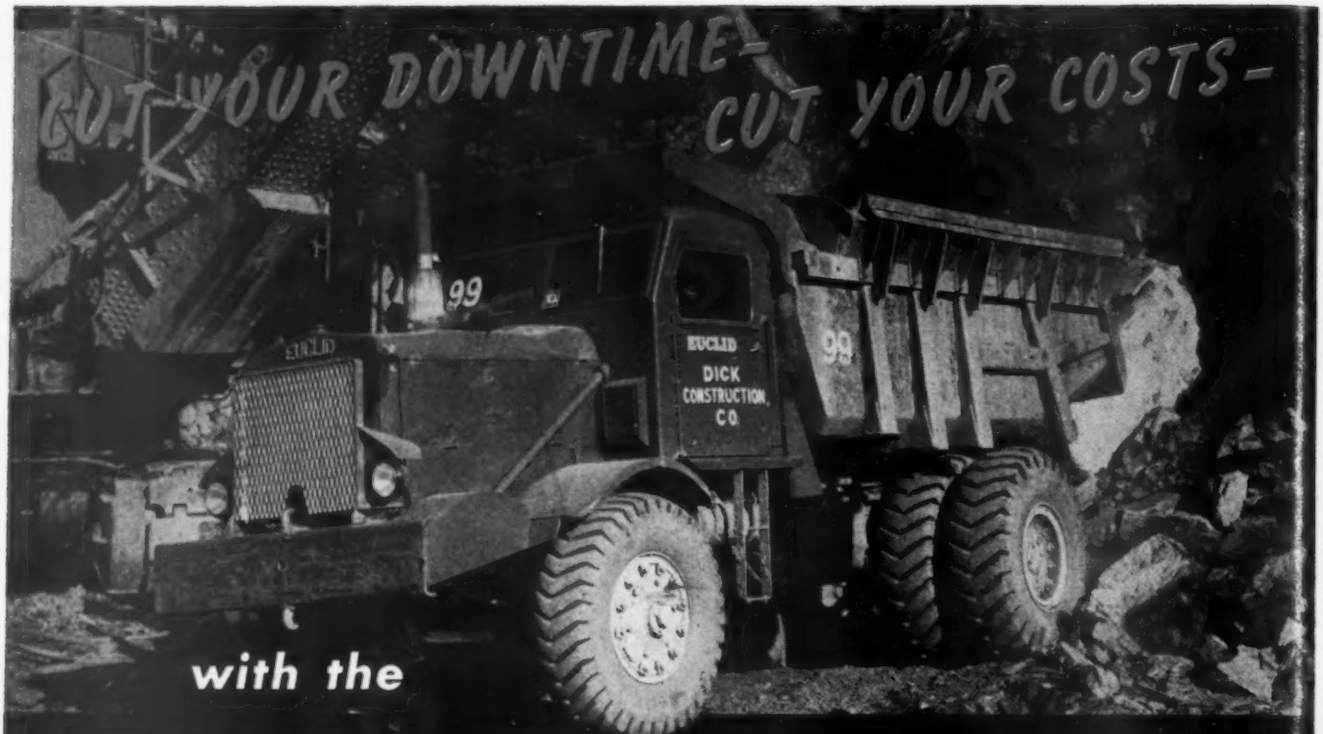
Subsidiary of Blaw-Knox Co.

ADNUN

TRADE MARK REGISTERED

BLACK TOP PAVER





with the

TOUGHEST TIRE EVER BUILT . . .

THE Firestone ROCK GRIP

DOWNTIME is a profit killer. To cut costs you've got to have a tire that is tough enough and strong enough to stand up on the job day in and day out without time loss. Firestone tires do that.

There's a Firestone tire for every off-the-highway job. There's the strong, rugged Rock Grip with a tough, massive tread for rock work, strip mining — for every job where punishment is severe. There's the Ground Grip with long, strong traction bars for earth biting power and maximum traction. There's the Earth Mover for free rolling wheels where maximum flotation and carrying capacity are required.

Firestone Off-the-Highway tires and Firestone service are cutting costs for contractors everywhere. They will cut your costs too. A trial on your equipment will prove it.

Listen to the Voice of Firestone every Monday evening over NBC and Americana over NBC Network Television Stations

Copyright, 1949, The Firestone Tire & Rubber Co.

Firestone
OFF-THE-HIGHWAY TIRES

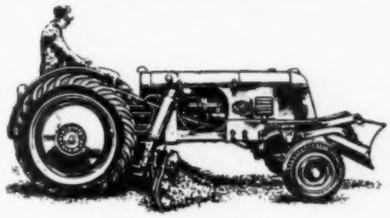
THE COMPLETE HUBER TANDEM LINE

Gives You A ROLLER FOR ANY COMPACTION JOB

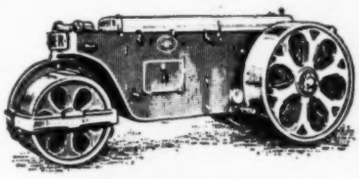
Make versatility the keynote in selecting your new road machinery. The ability of the Huber Tandem roller to do the work of a number of different size rollers with equal satisfaction is cutting investment and maintenance costs for many contractors.

You'll save money too, on actual operations—Huber rollers being known the world over for rugged construction that keeps them on the job . . . speed and maneuverability that gets the job done . . . power and stamina that makes any job easier. Mechanical features of the tandem line include: 3 speeds forward and reverse, hydraulic steering, dual controls, gasoline or Diesel engine power, and anti-friction bearings.

Before you buy road machinery of any type check Huber's complete line of 3-wheel rollers . . . maintainers . . . tandem rollers . . . and trench rollers. They are designed to save—built to last—and sure to satisfy your road machinery demands. Write today for bulletins and name of dealer nearest you.



THE HUBER MAINTAINER
with bulldozer, patch roller, berm leveler, lift loader, mower, broom or snow plow attachments.



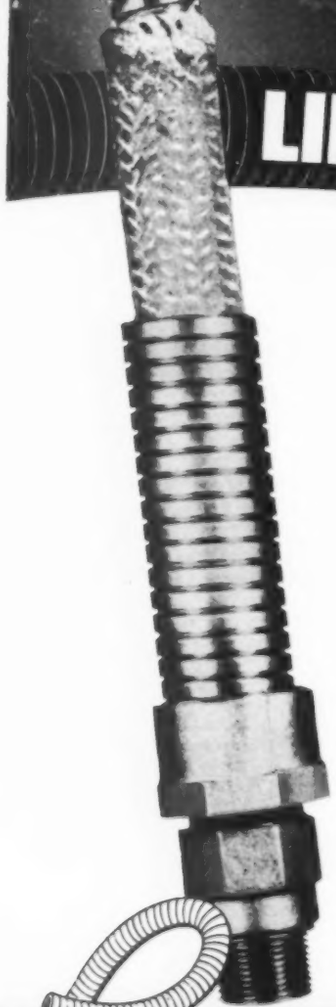
HUBER 3-WHEEL ROLLERS
4 models — 5 to 12 tons

THE HUBER MFG. COMPANY
Marion, Ohio, U.S.A.

HUBER

3 Wheel • Tandem
ROAD ROLLERS
and
MAINTAINERS

LIFE LINE FOR TAR MIXERS



Penflex flexible metal hose assures trouble-free transmission of hot tar for road surfacers

ON PAVING MIXERS, Penflex hose is ideal for free-flowing transmission of tar from tank trucks to mixer. Resists crushing, kinking, severe abrasion.

ON ROAD SPRAYING TRUCKS, precision-made Penflex offers tight, leak-proof service for filling tanks and for connection to spraying apparatus.

ON TAR AND ASPHALT HEATERS, Penflex hand hose, shown on left, prevents dangerous burns to operators using hand sprayers. Sturdy interlocked hose is insulated with heavy braided asbestos. Entire unit is encased by larger diameter hose with heat-proof couplings attached, assuring constant protection and safety.

48-HOUR DELIVERIES ARE OFFERED on the above items to meet emergency requirements. Call on Penflex for a complete line of flexible metal hose and couplings for efficient, long-lasting service plus helpful engineering assistance for the solution to your flexible tubing problems. Write today for Bulletin No. 91.

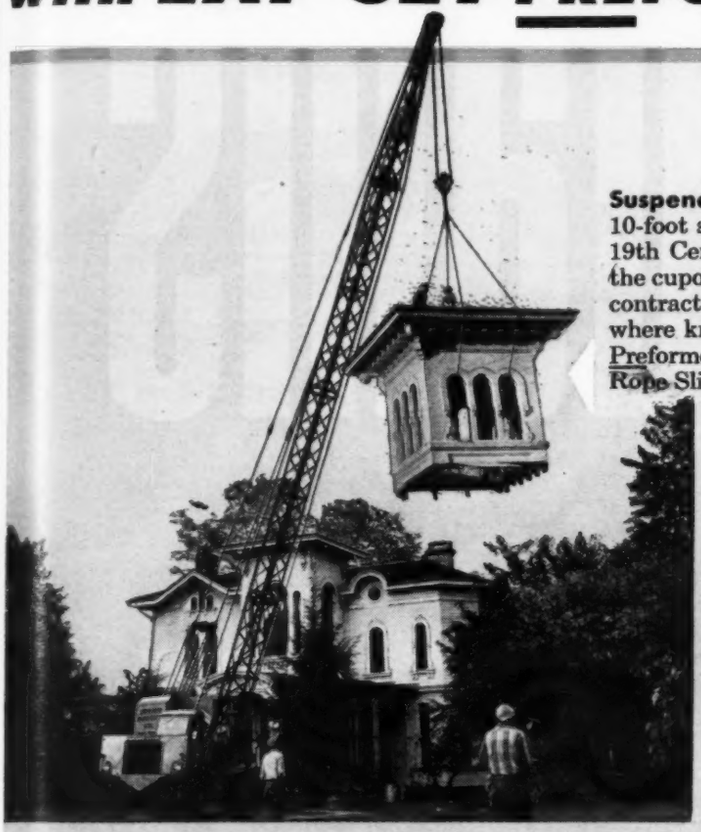
PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.
7216 Powers Lane — Philadelphia 42, Pa.

BRANCH SALES OFFICES—BOSTON • NEW YORK • CLEVELAND • CHICAGO • HOUSTON • LOS ANGELES

Penflex... HEART OF INDUSTRY'S LIFE LINES

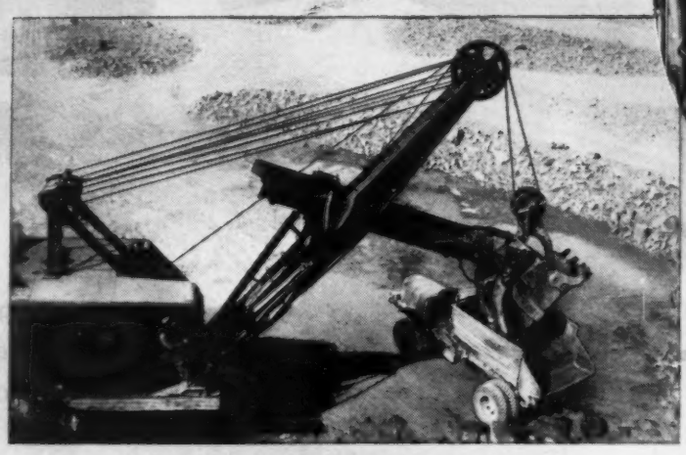
Copyright 1948

Improved Performance with LAY-SET PREFORMED



Suspended between heaven and earth is this 4-ton, 10-foot square cupola which enhanced the beauty of a 19th Century building. Serving only as an ornament, the cupola was finally condemned. Here was a job for a contractor with the right equipment. Contractors everywhere know that the *improved performance* of LAY-SET Preformed Wire Rope . . . and Acco Registered Wire Rope Slings . . . makes any job easier . . . reduces costs.

Up-to-date hoisting machinery, an alert operator, and LAY-SET Preformed Wire Rope mean greater safety and freedom from shutdowns. Coal mine, iron mine, "moly" mine . . . wherever a hoisting or haulage rope is used . . . LAY-SET Preformed means *improved performance.*



Down in the pit, out on the road, the power shovel digs in and changes the earth's profile. Rope life may be long . . . or short. LAY-SET Preformed is engineered to give *improved performance* . . . to make the rope last longer.

Improved performance *comes from a combination of top quality wire rope PLUS correct recommendations. Hazard offers you this combination in LAY-SET Preformed PLUS a nation-wide distributor organization. Always ask for LAY-SET Preformed . . . the Green Strand Wire Rope.*

LAY-SET *Preformed* GREEN STRAND WIRE ROPE

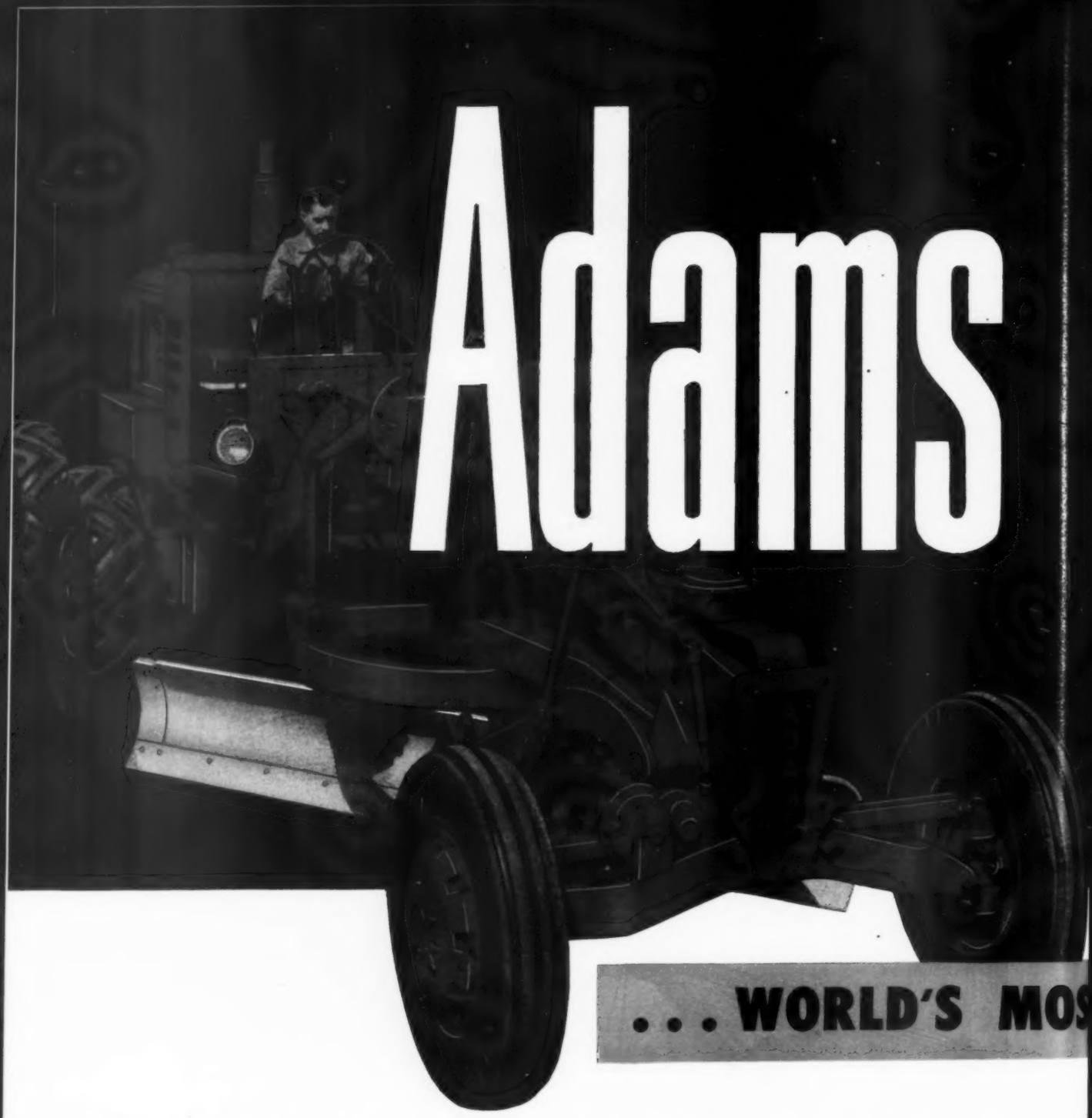
ACCO *In Business for Your Safety*

HAZARD WIRE ROPE

A DIVISION OF AMERICAN CHAIN & CABLE

TRADE MARK

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Tacoma, Seattle, Bridgeport, Conn.



Buy Right! Buy Adams! Choose your motor grader from the line that offers you models in the widest selection of sizes and prices.

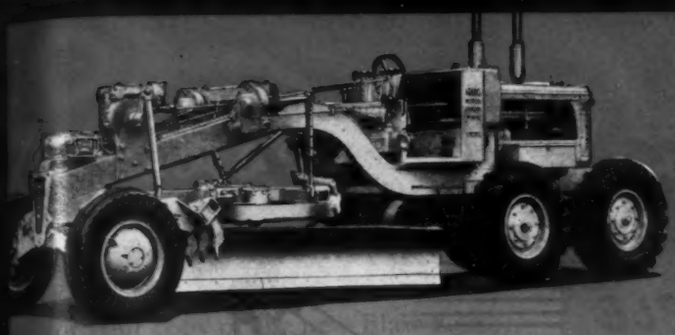
Six models make up the Adams line. These range from the 31 hp. general utility machine to the big 100 hp. extra heavy-duty model. All are of the same proved design. All feature high blade lift, positive mechanical controls and a wide range of blade positions and operating speeds.

From largest to smallest, all Adams Motor Graders are capable of the same wide range of work, in proportion to their size and power—everything from ditching and bank cutting to all kinds of surface grading, mixing and road and street maintenance.

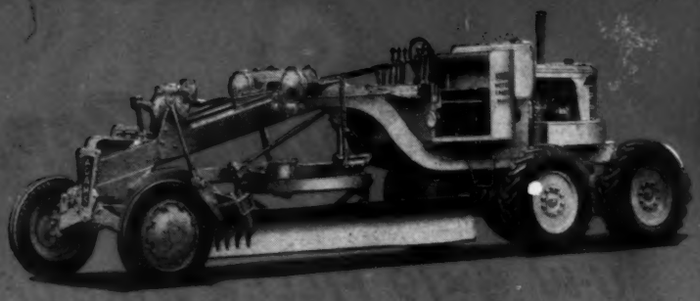
Highway official or contractor—big operator or small—there's an Adams Motor Grader with the *right* power and *right* capacity to meet your individual needs exactly.

For complete information on the *World's Most Complete Line of Motor Graders,* see your near-by Adams dealer.

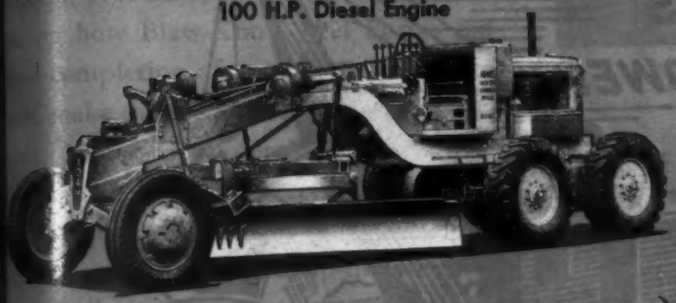
J. D. ADAMS MANUFACTURING COMPANY • INDIANAPOLIS, INDIANA



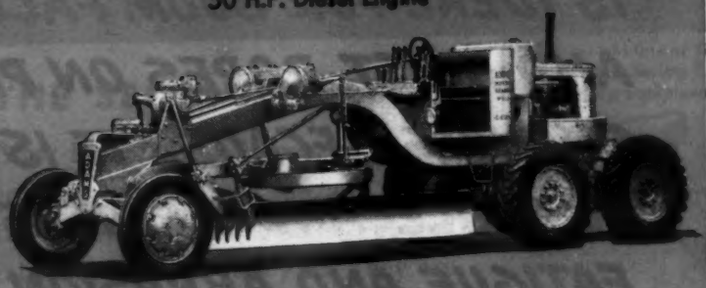
No. 610—Extra Heavy-Duty Model
100 H.P. Diesel Engine



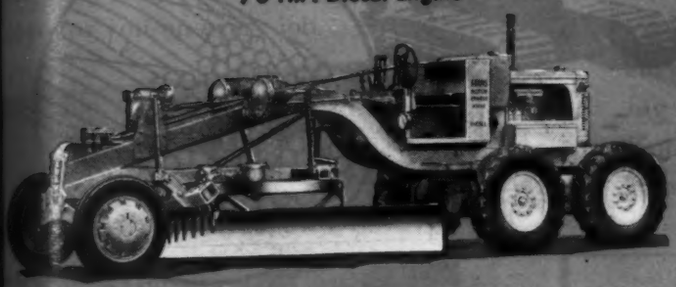
No. 312—Medium-Duty Model
50 H.P. Diesel Engine



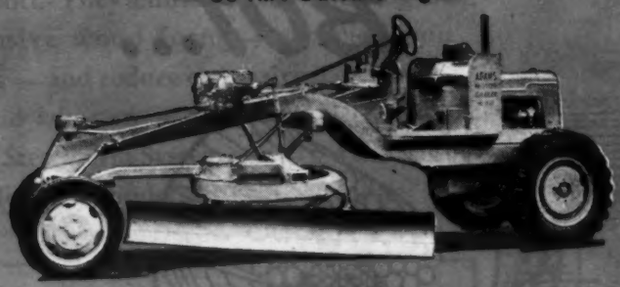
No. 512—Standard Heavy-Duty Model
76 H.P. Diesel Engine



No. 305—Medium-Duty Model
50 H.P. Gasoline Engine



No. 414—Light Heavy-Duty Model
76 H.P. Diesel Engine



No. 201—General-Utility Model
31 H.P. Gasoline Engine

COMPLETE LINE OF MOTOR GRADERS

Make your next motor grader an

ADAMS

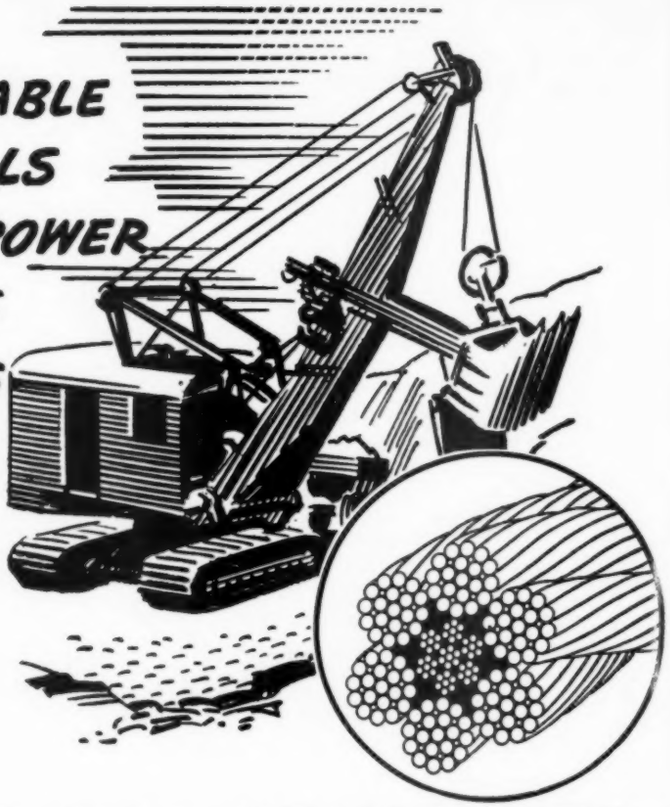
ONLY ADAMS OFFERS ALL THESE OUTSTANDING ADVANTAGES

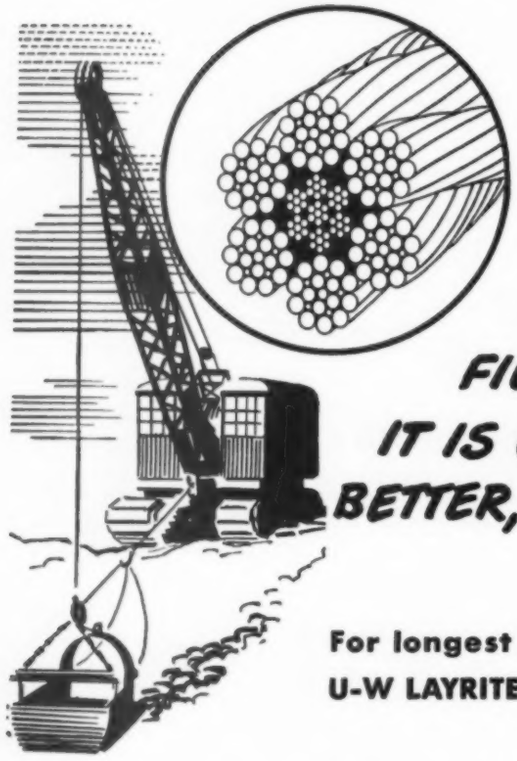
- 8 Overlapping Forward Speeds
- High-Arch Front Axle for Clearance
- Push-Button Starting from Cab
- Positive Mechanical Controls
- Wide Range of Blade Adjustments
- Exceptional Blade Clearance in All Operating Positions
- Balanced Weight Distribution
- Easy Access for Fast Servicing
- World-Wide Dealer Service

SOME ROPES FOOL YOU

U-W 6×19 FILLER WIRE CABLE IS IDEAL FOR BOOM FALLS AND HOIST ROPES ON POWER SHOVELS BECAUSE IT IS FLEXIBLE AND RESISTS FATIGUE AND ABRASION

BUT...

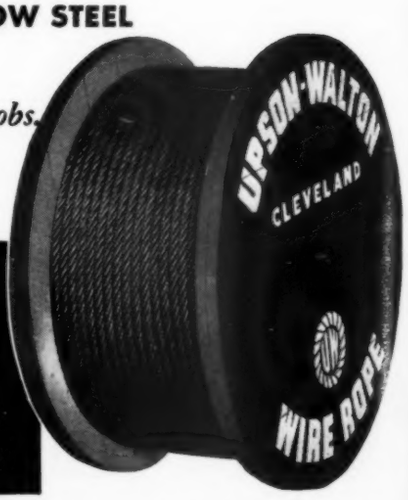




FOR DRAG CABLES ON DRAG LINE EXCAVATORS, U-W 6×16 FILLER WIRE IS BETTER BECAUSE IT IS COARSE AND RESISTS ABRASION BETTER, YET IS SUFFICIENTLY FLEXIBLE

For longest and best service, always specify
U-W LAYRITE (*Preformed*) IMPROVED PLOW STEEL

We invite you to let UPSON-WALTON engineer your tough rope jobs.



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THE UPSON-WALTON COMPANY

Manufacturers of Wire Rope, Wire Rope Fittings, Tackle Blocks, Brattice Cloth

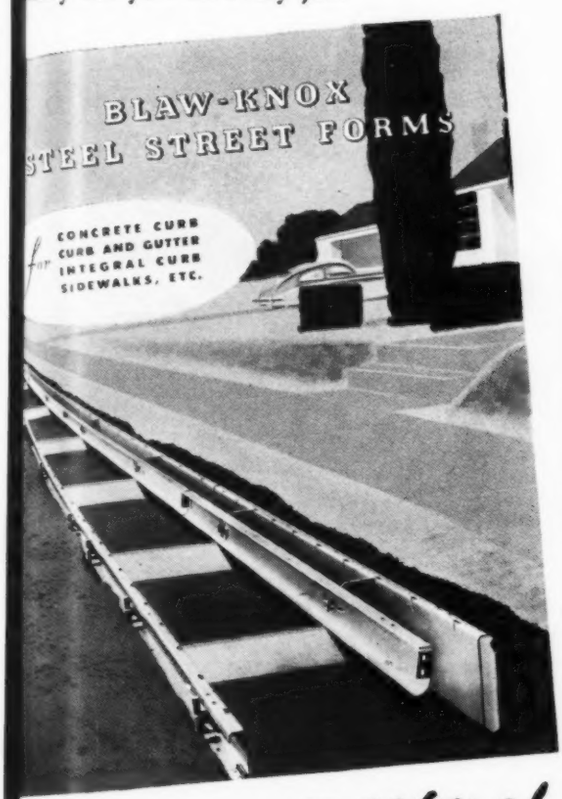
Main Offices and Factory: Cleveland 13, Ohio

114 Broad Street, New York 4 | 3525 West Grand Ave., Chicago 51 | 241 Oliver Building, Pittsburgh 22

TWO EASY STEPS for solving your CURB...SIDEWALK CURB and GUTTER PROBLEMS

THE FIRST STEP

Send for your copy of the new Blaw-Knox Bulletin, No. 2259, for complete information on how Blaw-Knox Steel Forms can speed completion of your curb and gutter work, make each job better and more profitable. 24 pages of detailed illustrations show form set-ups for every type of work with complete instructions on how to use them. From this complete, up-to-date Steel Form Bulletin select the design that will meet all your requirements, make more money for you on every job.



Send for your copy of

BULLETIN 2259

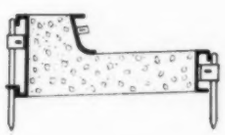
NOW!

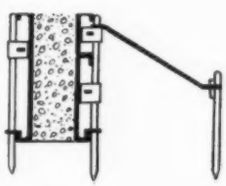
THE SECOND STEP

Use Blaw-Knox Steel Forms to insure greater profit on your next job, and on all your future concrete curb, curb and gutter, integral curb, and sidewalk jobs. They are easy to set, easy to strip, easy to handle and transport. They eliminate the building of expensive wood forms — especially on curves — and reduce expensive hand finishing and labor costs. Start using the Blaw-Knox Steel Form System now—it's the most complete and modern system available.

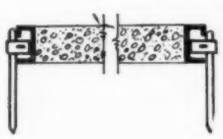
Here are just a few of the Blaw-Knox form designs available for any job!

CURB AND GUTTER FORMS. For concrete curb and gutter when curb is battered and has radius at bottom.



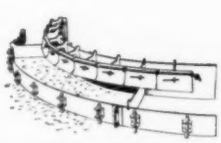


STRAIGHT CURB FORMS. For curb with both faces vertical. Auxiliary bracing system for lateral stability.



SIDEWALK FORMS. Furnished for any required width or thickness of sidewalk.

FLEXIBLE STEEL RADIUS FORMS. For curved work of variable radius. Back forms, gutter forms and battered curb face form can be set to any desired radius.



A complete line of Ti and Labor Saving C struction Equipmen

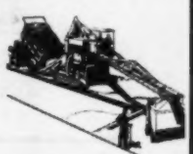
AGGREGATE PLANT

TRUCK MIXERS

FINISHING MACHINE

CLAMSHELL BUCKET

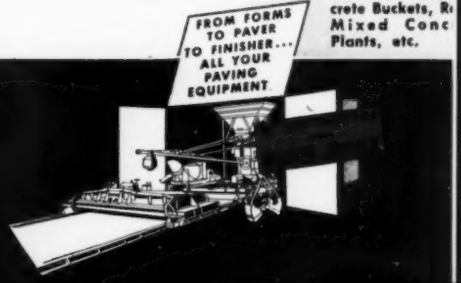
BULK CEMENT PLAN



CONCRETE PAVERS
Road Forms, Pa
Spreaders, Ad
Black Top Pav
Kinetic Mixers,
crete Buckets, R
Mixed Conc
Plants, etc.

BLAW-KNOX

BLAW-KNOX DIVISION of Blaw-Knox Company
Farmers Bank Bldg., Pittsburgh 22, Pa.
Birmingham • Chicago • New York • Philadelphia • Washington



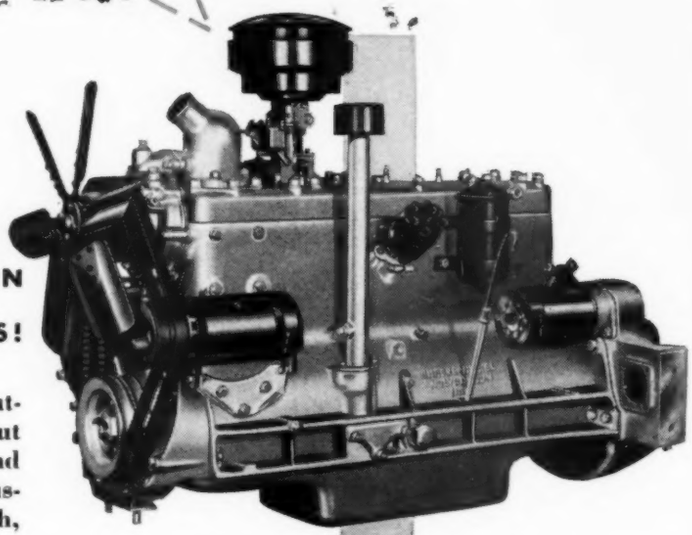
FOR A BETTER DAY'S WORK

in forests–

IN INDUSTRY—IN OIL FIELDS—ON FARMS—AND ON THE HIGHWAYS!

● The logging industry delivers record cuttings year after year . . . tremendous output figures made possible by careful planning and efficient, dependable power. Chrysler Industrial Engines and Power Units provide smooth, economical horsepower for sawmills, generators, air compressors, industrial mobile units, cranes and other logging equipment. For information about the full Chrysler Industrial line and its applications in all fields, write . . .

INDUSTRIAL ENGINE DIVISION, CHRYSLER CORP.
12200 E. JEFFERSON, DETROIT 31, MICHIGAN



MODEL INDUSTRIAL 14
SIX CYLINDER

Bore 3¾". Stroke 5". 331.4 cubic inches displacement. Engine assembly equipped with truck type clutch housing, 20" suction type fan, hot type oil bath carburetor air cleaner, carburetor with built-in velocity type governor, oil filter with removable type cartridge, and 6-volt electrical equipment. Generally used in powering snow shovels, industrial mobile units, sawmills and air compressors.

CHRYSLER

INDUSTRIAL ENGINES AND POWER UNITS

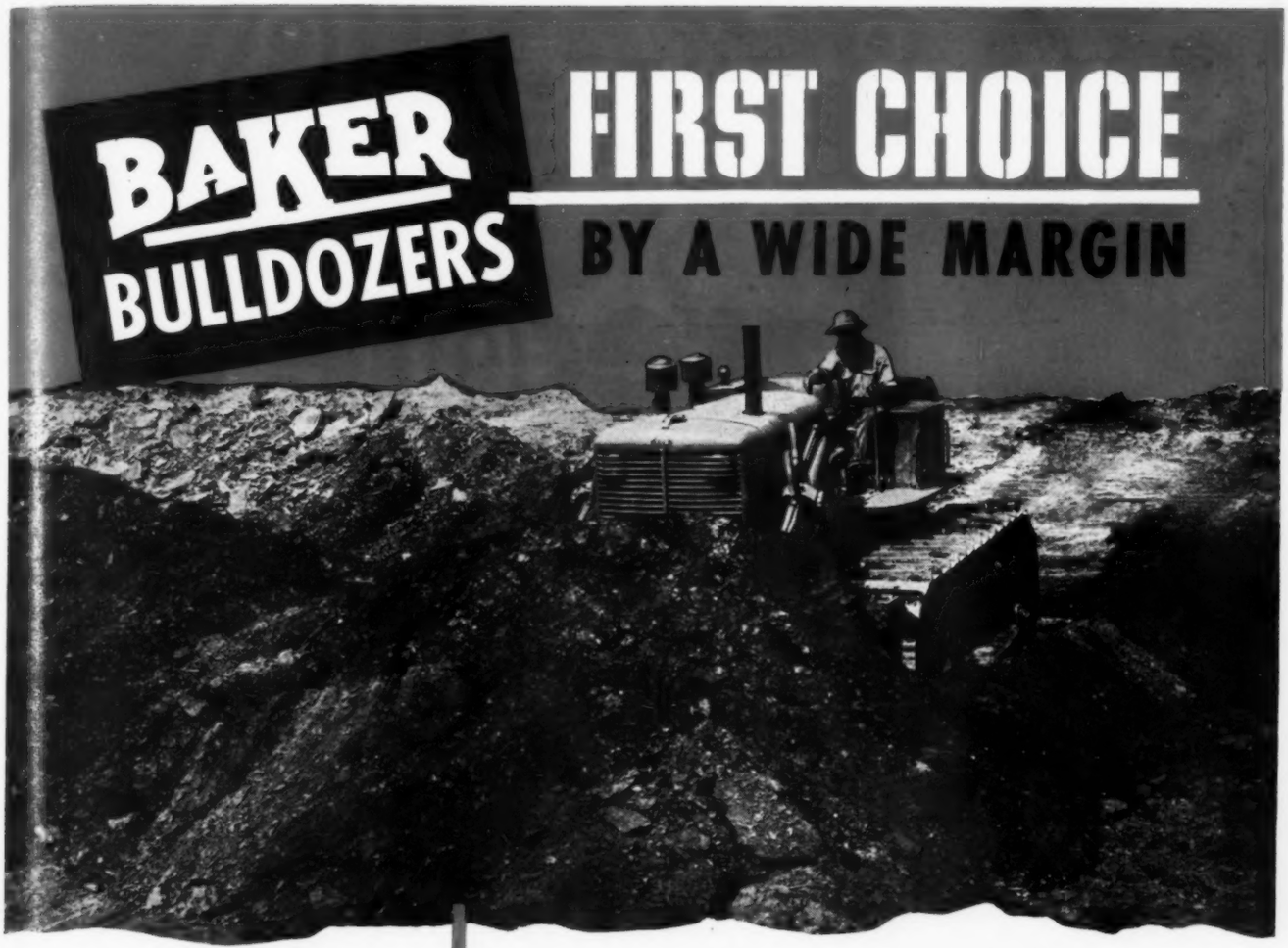
HORSEPOWER WITH A PEDIGREE

MODELS AVAILABLE WITH *gyrol* FLUID COUPLINGS

BAKER BULLDOZERS

FIRST CHOICE

BY A WIDE MARGIN



A Few Recent Purchasers of One or More Baker Dozers and A-C HD-19 Tractors

O'DELL-RINEY CONST. CO.
Contractor — Hannibal, Mo.

OOLITE ROCK CO.
Quarry — Miami, Fla.

S. A. HEALY CO.
Contractor — White Plains, N. Y.

CONSUMERS POWER CO.
Utility — Jackson, Mich.

MAUMEE COLLIERIES
Coal Mine — Terre Haute, Ind.

SUNLIGHT COAL CO.
Coal Mining — Boonville, Ind.

DAYTON POWER & LIGHT CO.
Utility — Dayton, Ohio

WYANDOTTE CHEMICALS CORP.
Quarry — Alpena, Mich.

LONE STAR CEMENT CO.
Cement — Bonner Springs, Kan.

CHILE EXPLORATION CO.
Mining — New York, N. Y.

SMITH CONTRACTING CORP.
Contractor — Ft. Worth, Texas

ROBINSON CLAY PROD. CO.
Quarry — Akron, Ohio

HYDRO-ELECTRIC POWER COM'N.
Utility — Toronto, Can.

CANADIAN INTERNATIONAL PAPER CO.
Logging — Montreal, Can.

OLIVER IRON MINING CO.
Mining — Duluth, Minn.

The Baker Bulldozer and HD-19 Allis-Chalmers tractor combination has really rocked the industry — amazed even the most experienced earth-movers with its power, traction and speed — with its ability to move more yardage than any unit in its class.

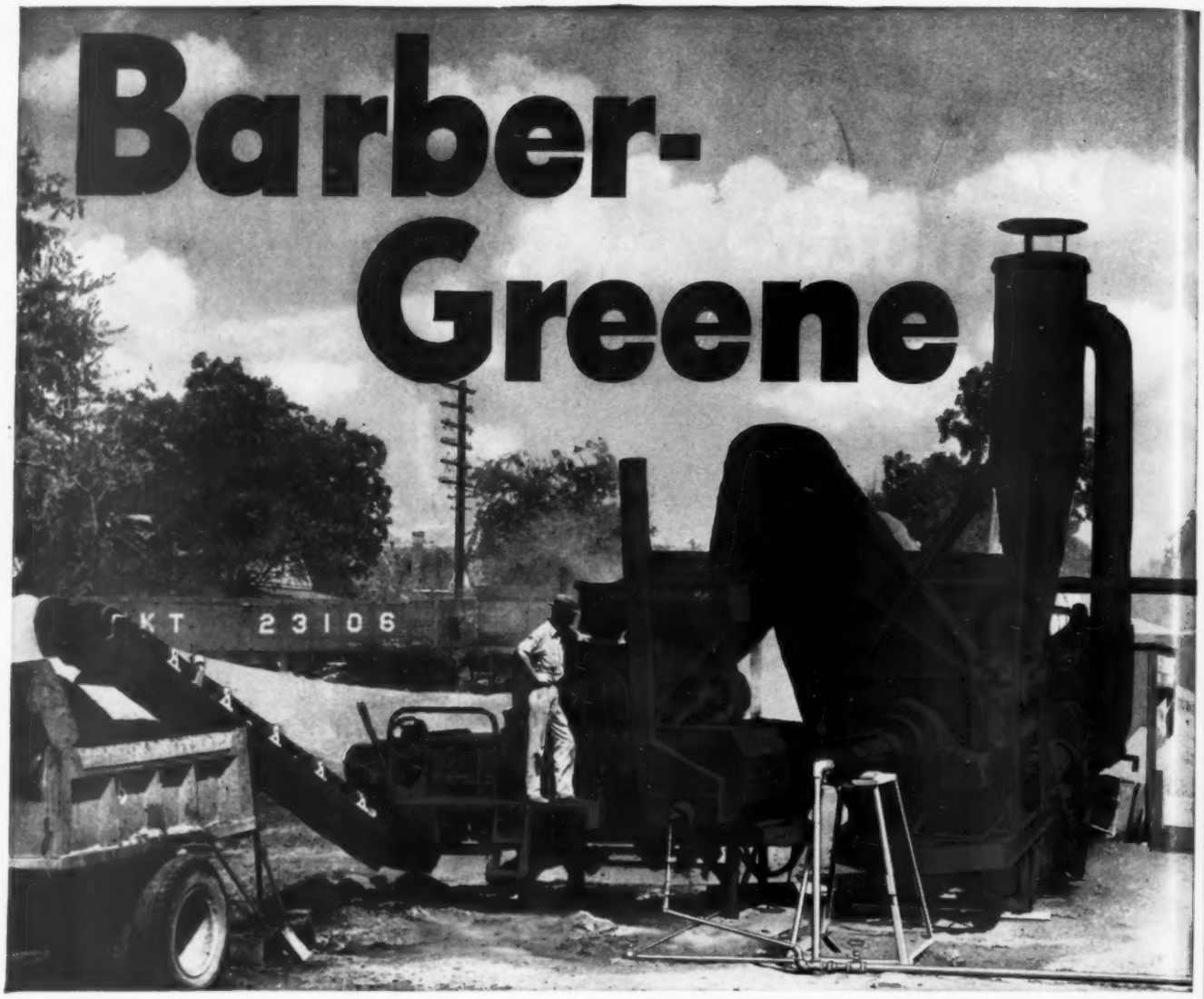
The Baker Hydraulic Bulldozer is perfectly matched in operating speed, balance and weight . . . important factors in getting the most out of the tractor. Its simplicity of design and operation mean faster bulldozing with less operator fatigue plus longer, trouble-free service.

Now, with buying again becoming selective, it is significant that from coast to coast — among contractors, quarries, mines, utilities and loggers — among experienced earth-movers who've tried them all, it's Baker Bulldozers by a wide margin. Before you buy any bulldozer, check with your Baker - Allis-Chalmers dealer.

BUY THE BEST . . . BUY BAKER

BAKER

SPRINGFIELD • ILLINOIS



Typical set-up of the Barber-Greene Maintenance Plant. Various combinations to meet your immediate needs may be easily arranged.

This *Small* Bituminous Mixing Plant Does a *BIG* Job!

Here's a complete, easy-to-operate, small bituminous mixing plant! It is specifically designed for maintenance and repair work, small road building projects and a variety of other surfacing jobs. The B-G Maintenance Plant will handle any type of mix, and its capacity is remarkable, considering its size and portability.

The B-G Maintenance Plant is truly portable and easily erected. Small enough to operate at low cost on maintenance and general repair work, it is still large enough to handle small construction projects. It operates on the same principles as the larger Barber-Greene Central Plant, measures the correct amount of aggregate and bitumen, thoroughly mixes them and discharges the mix into trucks.

It consists of two basic units—the 840 Mixer and 830 Aggregate Dryer. Each unit is equipped with a towing hitch and pneumatic tires to trail smoothly behind your truck when going from job to job. A complete line of auxiliary equipment available including Reciprocating Feeder, Bins, Dust Collector, etc. For illustrative literature, write Barber-Greene Company, Aurora, Illinois.

BARBER-GREENE COMPANY • AURORA, ILLINOIS

Constant Flow Equipment

LOADERS | PERMANENT CONVEYORS | PORTABLE CONVEYORS | COAL MACHINES | BITUMINOUS PLANTS | FINISHERS | DITCHERS

1+1=3

1 JAW CRUSHER
1 *TWINDUAL** ROLL CRUSHER
3 STAGES OF REDUCTION

For gravel requiring a large opening jaw crusher our 293Q Pacemaker also features the **TWINDUAL** *method. Ask for Bulletin 31AA.*

UNIVERSAL

Designers and builders of "Stream-Flo" rock, gravel, and lime plants, screening and washing plants, conveyors, apron feeders.

OTHER PETTIBONE MULLIKEN PRODUCTS . . . Pumps, Clamshell and Dragline Buckets, Speed Loaders, Snow Loaders, Conveyors of all kinds, Car Unloaders.

INCREASE PRODUCTION 50 to 100%

Reduce cost per yard with Universal's *TWINDUAL* Master Gravel Plant

Here's the gravel plant designed to serve your requirements now and for a long time to come. Universal "Stream-Flo" engineering sets the standard for high production and ready portability with three full stages of reduction in a single-unit plant.

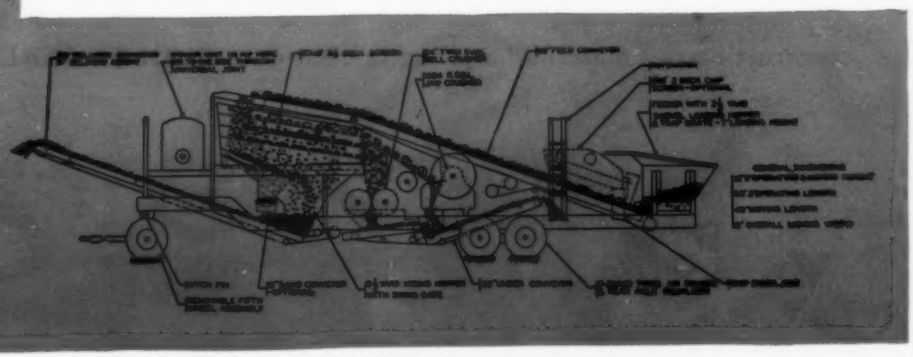
Proved in performance, proved in profit-making capacity, the ***TWINDUAL*** Master will outproduce conventional plants of comparable size and weight by 50 to 100%.

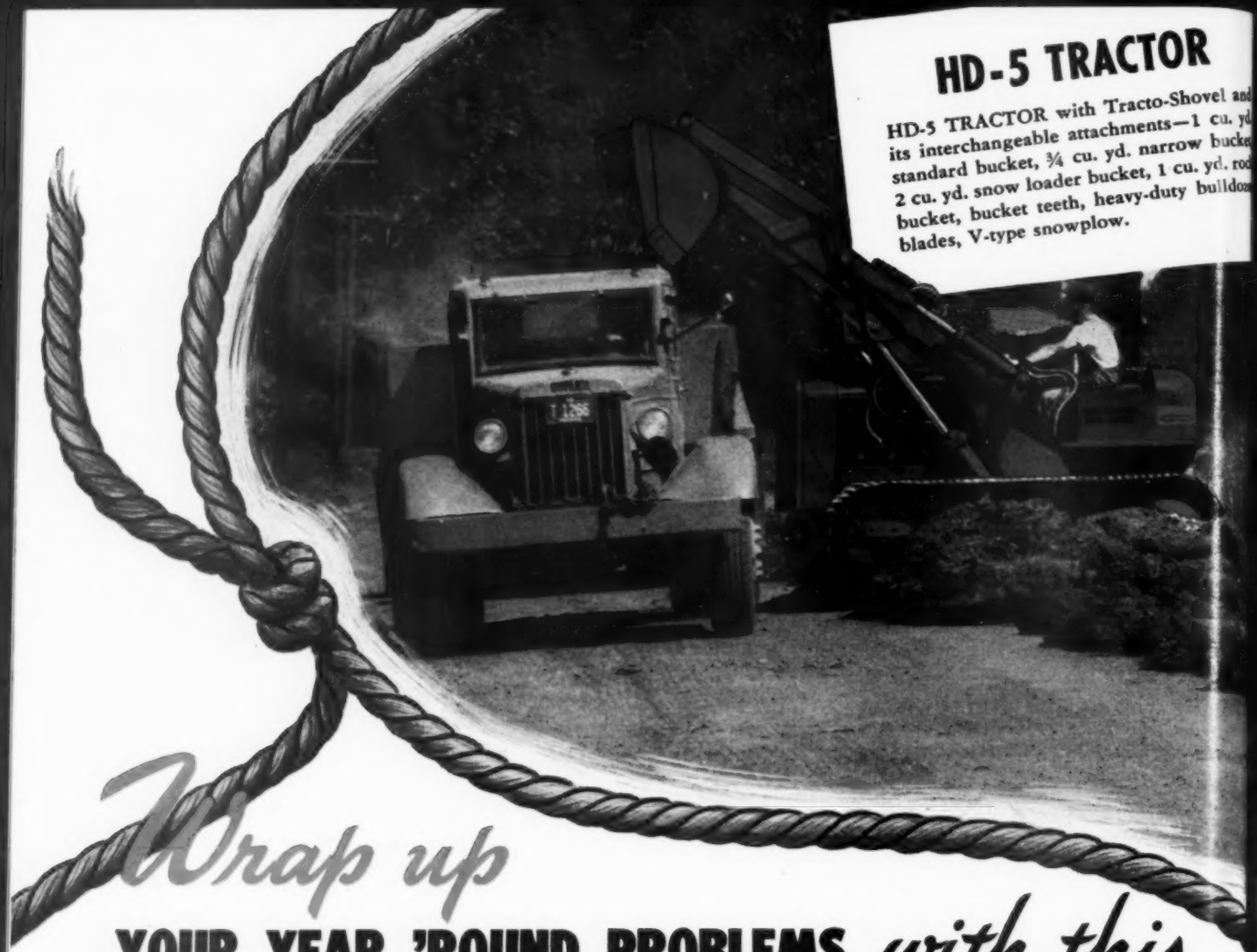
This modern plant features a Streamline jaw crusher in the first stage, and the ***TWINDUAL*** Method* of secondary reduction in the second and third stages. This exclusive Universal development gives all the advantages of two separate roll crushers without the bulk and weight . . . primary capacity is doubled, jaw crusher maintenance reduced. The over-all result is TOP CAPACITY AT LOWEST COST PER YARD. For complete details write for Bulletin No. 682.

THE UNIVERSAL ENGINEERING CORPORATION

631 C Avenue N. W. Cedar Rapids, Iowa

A Division of **PETTIBONE MULLIKEN CORPORATION • Chicago • New York**





HD-5 TRACTOR

HD-5 TRACTOR with Tracto-Shovel and its interchangeable attachments—1 cu. yd. standard bucket, ¾ cu. yd. narrow bucket, 2 cu. yd. snow loader bucket, 1 cu. yd. rock bucket, bucket teeth, heavy-duty bulldozer blades, V-type snowplow.

Wrap up

YOUR YEAR 'ROUND PROBLEMS *with this*

EQUIPMENT PACKAGE

Reduce your equipment investment with this equipment package. No need to have a number of specialized machines for various jobs. Any maintenance work . . . and much of your construction . . . material handling . . . snow removal and loading are quickly, efficiently done with this versatile combination—AT BIG SAVINGS. Let your Allis-Chalmers dealer tell you all about this LOW COST, BUDGET STRETCHING PLAN . . . NOW!

BD-3 MOTOR GRADER

BD-3 MOTOR GRADER, 78 brake h.p., 19,042 lbs. . . . or any other A-C diesel-powered model—AD-4, 104 brake h.p., 22,140 lbs.; AD-3, 78 brake h.p., 21,835 lbs.; BD-2, 50.5 brake h.p., 17,772 lbs.

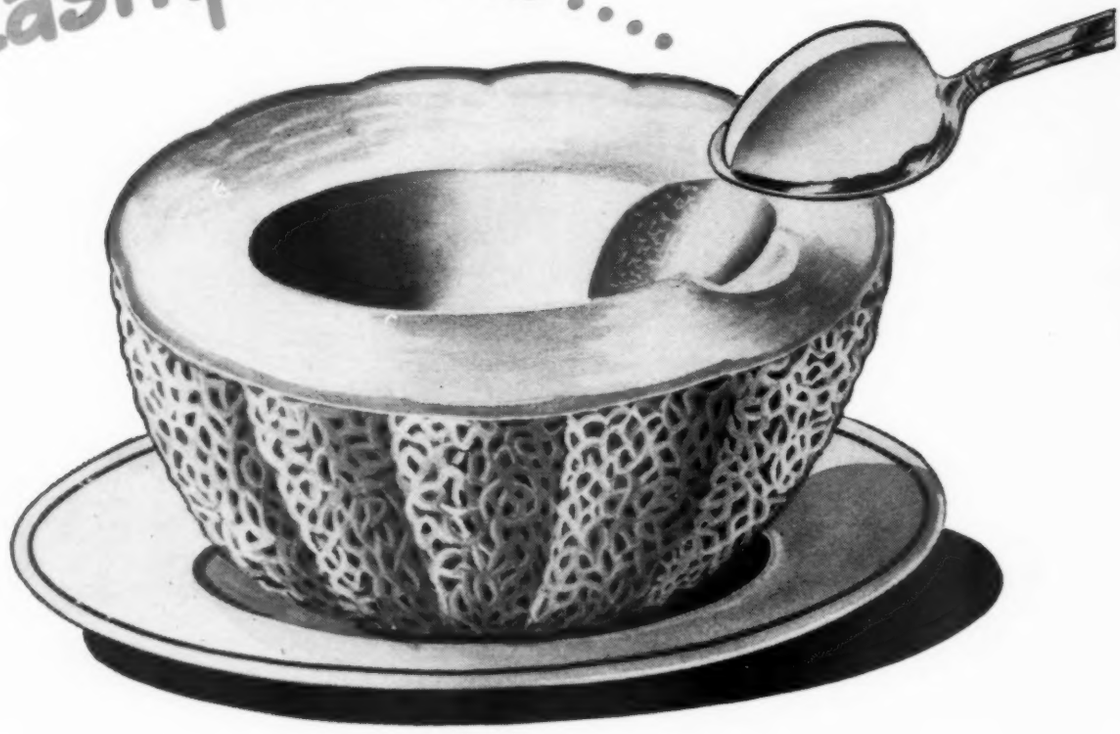
SOME OF THE JOBS YOU CAN DO WITH JUST THESE TWO MACHINES

- Clean and shape-up ditches
- Cut and smooth backslopes
- Handle regular maintenance
- Widen and reshape roads
- Make driveways and bridge approaches
- Build berms
- Scarify roads and streets
- Backfill pipe, culverts, bridges
- Take out cuts
- Remove and load sod
- Load surplus dirt from shoulders and ditches
- Remove and load topsoil
- Make fills
- Handle bulldozing
- Make channel changes
- Plow, move and load snow from roads and streets, alleys, parking lots, cemeteries, institutions
- Skid trees
- Load rocks and stumps
- Dig and load dirt
- Load sand, gravel and other material
- Mix black-top
- Do crane work
- Handle all types of hauling or pulling
- Straighten out curves
- Open and rebuild alleys and streets
- Build parking lots
- Cut away embankments obstructing sight

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

As Easily As This....



THE "Ottawa" HYDRAULICALLY CONTROLLED BUCKET

The Ottawa Heavy Duty Industrial loader with mechanical bucket. These quality loaders can now be had with hydraulically controlled bucket. Loaders available for most makes Industrial Tractors.

SCOOPS, LIFTS, UNLOADS

just as easily as you take that first bite from a dead ripe melon. Ottawa Heavy Duty Industrial loaders now offer as optional equipment hydraulically controlled buckets. This scientifically designed bucket gives you greater lifting power and maneuverability with less strain on tractor or loader.

The Ottawa hydraulically controlled bucket gives the tractor operator complete control of each load at every stage of loading, lift or dump. Finger tip control gives safety and economy, saves wear and tear on all equipment, loader, tractor and trucks.

It's new—It's a feature your customer has been looking for—It's low cost—It's economical—Write today for complete details and price list.

The Ottawa INDUSTRIAL HYDRAULIC FRONT END LOADER

Ottawa STEEL PRODUCTS, Inc.
INDUSTRIAL DIVISION
OTTAWA, KANSAS • U. S. A.

EUCLID EFFICIENCY

SPEEDS ANOTHER TVA PROJECT

Nearly four million cubic yards of earth and rock will go into Watauga Dam, a TVA flood control and power project, near Elizabethton, Tennessee. The dam will have a fill structure 900 feet long and 318 feet high, with a base width of 1,275 feet.

Because of their proved efficiency and rugged staying power, "Eucs" have been widely used for construction of earth-fill dams. At Watauga 26 Bottom-Dump and 15 Rear-Dump Euclids haul earth and rock on a twenty-four hour schedule. A Euclid Loader keeps pace with the speed and efficiency of Euclid hauling equipment by providing fast mobile loading of the Bottom-Dumps.

From borrow pit to fill, "Eucs" haul big payloads at Watauga under a wide range of operating conditions. Of sturdy but simple construction, Euclid equipment gives peak performance day after day at low maintenance cost.

Several new models have been added to the Euclid line of earth moving equipment—write or phone your Euclid distributor or representative for descriptive literature and information.

The EUCLID ROAD MACHINERY Co.
Cleveland 17, Ohio

EUCLIDS *Move the Earth*

CHOOSE "QUICK-WAYS" REG. U. S. PAT. OFF. FOR SURE PROFITS!

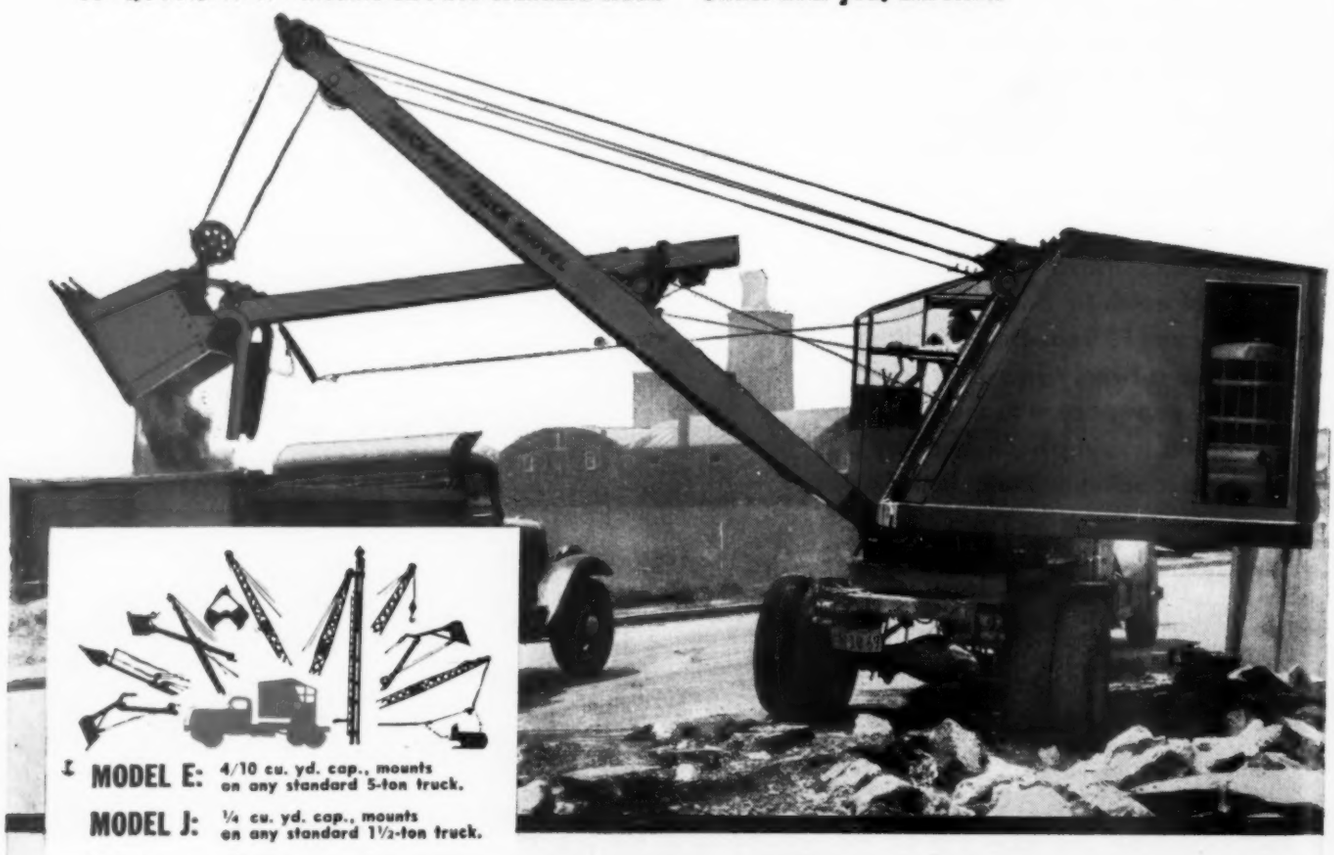
PORTABILITY AND CAPACITY . . . these are the fundamentals you KNOW you want in a truck shovel. You get PORTABILITY in a "*QUICK-WAY*" because it is built of steel for lightness and strength, no heavy counter-weights to slow you down. You get CAPACITY because balance and stability are designed into your "*QUICK-WAY*".

In addition you get SPEED . . . PERFORMANCE . . . VERSATILITY . . . INTERCHANGEABILITY . . . SIMPLICITY . . . ECONOMY OF OPERATION . . . LOW FIRST COST . . . LOW MAINTENANCE . . . and EXTRA PROFITS.

A "*QUICK-WAY*" mounts on ANY standard truck of proper size to go anywhere a truck can go at truck speed. A "*QUICK-WAY*" is CONVERTIBLE IN MINUTES from Shovel to CRANE, DRAGLINE, CLAM-SHELL, PILE DRIVER, SCOOP, TRENCH-HOE or BACK FILLER. You buy only the attachments you want. A "*QUICK-WAY*" is simply built, with many interchangeable parts, all easy to service . . . and durable.

THE FUNDAMENTALS built into every "*QUICK-WAY*" add up to sure profits on a small investment, with one of the most useful machines you can own.

NO MATTER WHAT OTHER EQUIPMENT YOU OWN, you need "*QUICK-WAYS*" too. There's a "*QUICK-WAY*" owner near you; ask HIM.



MODEL E: 4/10 cu. yd. cap., mounts on any standard 5-ton truck.

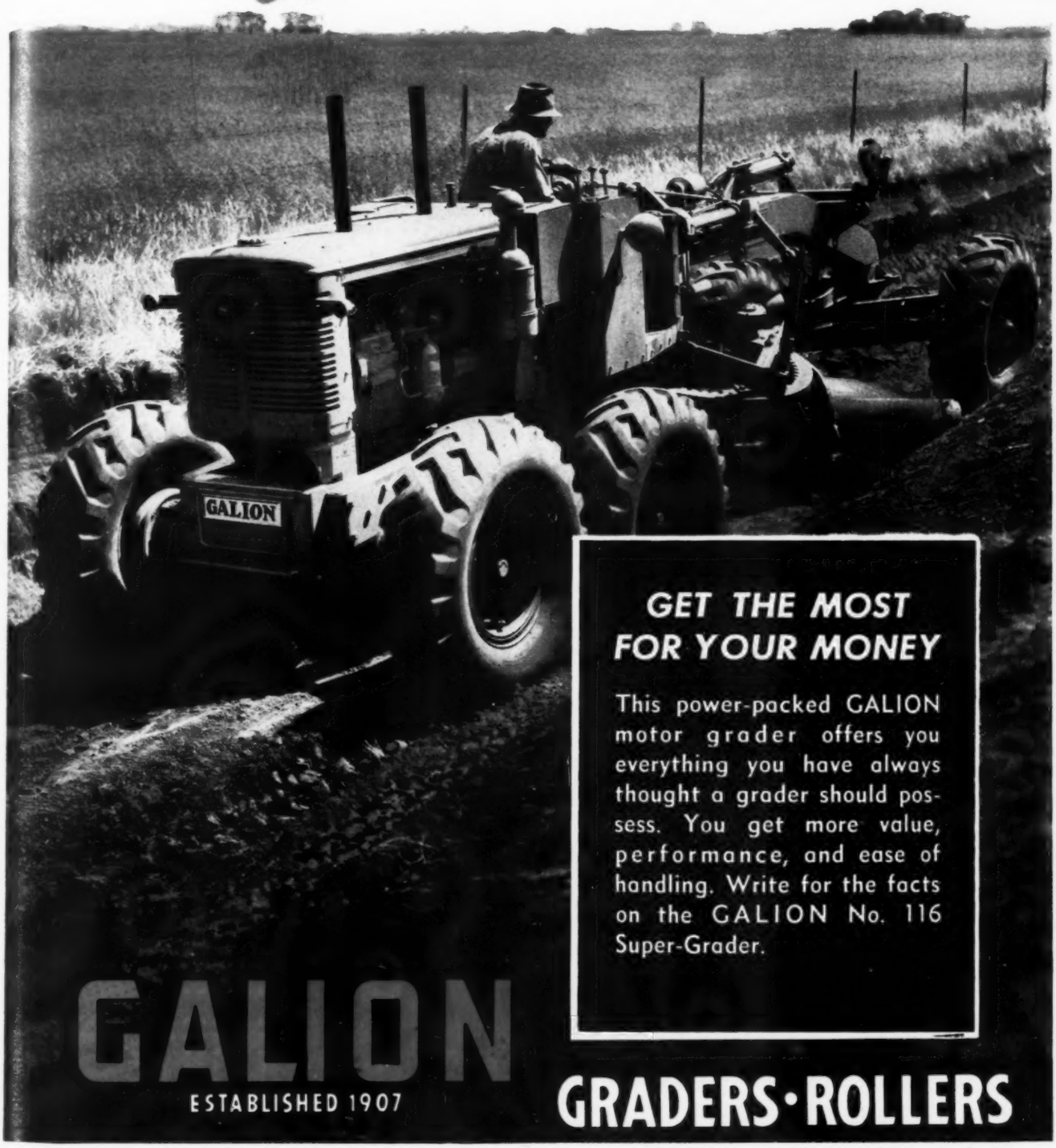
MODEL J: ¼ cu. yd. cap., mounts on any standard 1½-ton truck.

For speed, portability, economy of operation, and adaptability to a wider range of jobs, nothing of comparable size equals a "Quick-Way" Truck Shovel.

"QUICK-WAY" TRUCK SHOVEL CO.

DENVER, COLORADO

SEE THE GALION 116 BEFORE YOU BUY!



GET THE MOST FOR YOUR MONEY

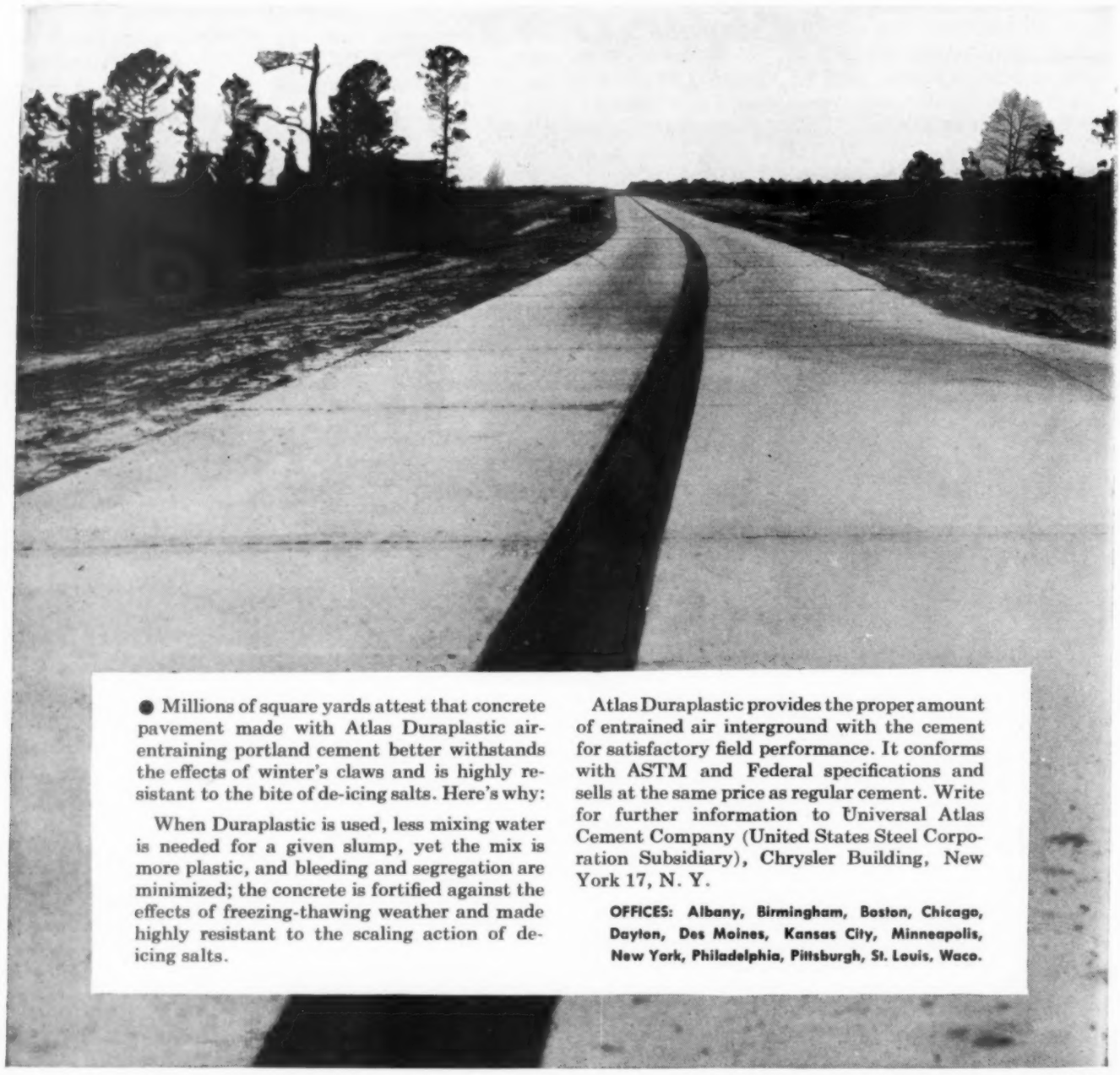
This power-packed GALION motor grader offers you everything you have always thought a grader should possess. You get more value, performance, and ease of handling. Write for the facts on the GALION No. 116 Super-Grader.

GALION
ESTABLISHED 1907

GRADERS · ROLLERS

THE GALION IRON WORKS & MFG. CO., General and Export Offices — Galion, Ohio, U. S. A.
Cable address GALIONIRON, Galion, Ohio

DURAPLASTIC fortifies concrete against effects of freezing and thawing



● Millions of square yards attest that concrete pavement made with Atlas Duraplastic air-entraining portland cement better withstands the effects of winter's claws and is highly resistant to the bite of de-icing salts. Here's why:

When Duraplastic is used, less mixing water is needed for a given slump, yet the mix is more plastic, and bleeding and segregation are minimized; the concrete is fortified against the effects of freezing-thawing weather and made highly resistant to the scaling action of de-icing salts.

Atlas Duraplastic provides the proper amount of entrained air interground with the cement for satisfactory field performance. It conforms with ASTM and Federal specifications and sells at the same price as regular cement. Write for further information to Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, N. Y.

OFFICES: Albany, Birmingham, Boston, Chicago, Dayton, Des Moines, Kansas City, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, Waco.

B8-D-82

ATLAS DURAPLASTIC

TRADE MARK REG. U. A. C. CO.

AIR-ENTRAINING PORTLAND CEMENT

MAKES BETTER CONCRETE AT NO EXTRA COST

"THE THEATRE GUILD ON THE AIR"—*Sponsored by U. S. Steel Subsidiaries—Sunday Evenings—ABC Network*

ONE *LIGHT.* THAT DOES THE WORK OF MANY

KEYSTONE Flashing Lights warn two ways at once—flash 80 "STOP" warnings per minute *to both front and rear.* Act as a "lighthouse" to save lives—eliminate lawsuits—help keep your safety record clean. Take a Keystone Flashing Light apart and see for yourself why it gives uninterrupted, trouble-free service for years and years. Write for sample light.

Auto Gear & Parts Co., Inc.
16th & Hunting Park Ave.,
Philadelphia 40, Penna.

KEYSTONE *FLASHING* LIGHT

Specially designed, heavy-duty light for highway use. Vibration proof—water and dust tight. Can be mounted anywhere on the vehicle. Supplied with 6½ inch red lenses lettered "STOP" or with plain red, amber or blue lenses for 6 and 12 volt systems.

Garrison Dam, under construction on the Missouri River near Garrison, North Dakota, will be the world's largest rolled-fill earth dam. When completed, the dam will be 210 feet high and over 2 miles long with a base width of nearly half a mile—a total fill of more than 70,000,000 cu. yds.

A load a

WITH GM

Euclid Bottom Dump, powered by GM Series 71 Diesel, dropping a load of fill dirt. Eight of these units, working with a BV Loader, hauled 631 such loads in a 10½ hour working day, an average of one load a minute. Haulage distance at this stage was about 500 yards.

ON the world's largest rolled-fill earth dam near Garrison, North Dakota, records for moving dirt are being smashed every day.

Bulk of the heavy equipment on the Garrison Dam project is powered by General Motors Series 71 Diesel engines. GM Diesels were selected for this job because–as the contractor puts it–"They can move dirt faster."

Reasons for this superior performance are obvious. GM Diesel engines are

Garrison Builders, Inc., operators of this equipment, are working on the 14 million yard stage-one contract on the west side of the river. Shown is a convoy of four Euclid Bottom Dumps approaching the embankment fill area.

minute . . .

DIESEL POWER

2-cycle—with power on every piston downstroke. They deliver a smooth, steady power output—twice as many power impulses for each revolution of the crankshaft. This added power-per-turn makes them more compact with more horsepower for their size than other type engines. They start instantly on their own fuel. Their simplified construction and clean design make maintenance much easier. Service problems are greatly simplified by the interchangeability of parts.

Add up these advantages and you'll see why General Motors Diesels are the first choice of construction men for any heavy-duty operation. Let us show you how these engines can bring greater efficiency and economy to your particular job. See your local equipment distributor or write direct to us.

GM
GENERAL MOTORS
DIESEL POWER

DIESEL BRAWN WITHOUT THE BULK

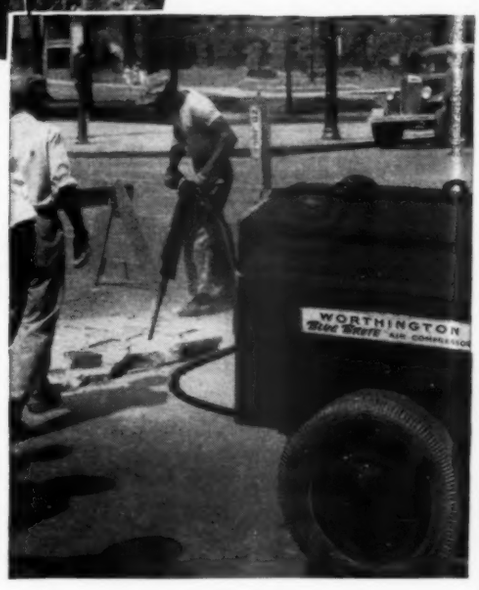
DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES... *Up to 200 H.P.* **DETROIT 28, MICHIGAN** MULTIPLE UNITS... *Up to 800 H.P.*

REPORT FROM OREGON:
"SPLENDID PERFORMANCE"

Blue Brute team-mates — three of a battery of WJ-45 Rock Drills, powered by Portable Air Compressors — used by the Del R. Beebe Construction Co. of Eugene, Oregon, excavating for a big housing project's sewerage system. The Beebe Co. reports "splendid performance" in every detail of Blue Brute operation.

Oregon and Ohio Agree: BLUE BRUTE AIR TOOLS ARE TOP COST-CUTTERS!



REPORT FROM OHIO: ***"VERY MUCH PLEASED"***

A Blue Brute construction team in Toledo, Ohio, removing street paving. Owner John V. Rush of Toledo says: "Our WB-85 Paving Breakers and 60′ Portable Compressors make ideal combinations. In four months' continuous operation, removing and replacing 6″ and 8″ concrete base, *we have had absolutely no maintenance trouble on this equipment.* We are very much pleased with it."

Put Blue Brute teams to work for you — and count on big savings from then on! Starting with Blue Brute Portable Compressors — 60′ to 500′— you've got the most dependable and economical air suppliers ever made . . . tireless, trouble-free performers, with the easy-breathing Feather* Valves that get *all* the air out of every drop of fuel.

Then hook up their famous Blue Brute team-mates — Hand-Held Rock Drills, Clay and Trench Diggers, Tampers, Sheeting Drivers, Wagon Drills — and you're making air go farther and do more than it ever did before. That's because these Worthington air tools not only hit harder and last longer — they have the lightness, compactness and *precision balance* that means easier handling . . . faster, smoother progress . . . hours and dollars saved on every job.

Learn how Blue Brute teamwork can save *you* time and money. See your nearby Blue Brute Distributor for more reasons why *there's more worth in a Blue Brute*, or write us direct.

*Reg. U. S. Pat. Off.

H9-11

WORTHINGTON

WORTHINGTON PUMP AND MACHINERY CORPORATION
Construction Equipment Department, Harrison, New Jersey
Distributors in all principal cities

BUY BLUE BRUTES

IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

AIRCO HARDFACING ALLOYS

add 2 to 25 times *LONGER SERVICE LIFE* to new and worn parts

SEVERE ABRASION

Pug mill knives, coke crusher rolls, mill guides and similar equipment, when hardfaced with Aircolite last many times longer, and at the same time give superior operating efficiency. For *extreme earth abrasion,* Airco Tungtube (tungsten carbide) is recommended.

IMPACT

Parts subjected to impact, like bucket lips, last longer when hardfaced with Airco Electric Self Hardening Alloy. Furthermore, parts can be rebuilt with this alloy at a fraction of new part cost. For *shattering impact,* Airco No. 388 is recommended.

HEAT and CORROSION

Aircoloy 1 and 6 effectively resist wear caused by heat and corrosion . . . for example, parts subject to intense heat, such as ingot tong bits, exhaust valves and seats, tap hole augers, and hot punches, last from 2 to 25 times longer when protected with these NEW Airco Hardfacing Alloys.

BUT TRY A FEW OF THESE NEW AIRCO HARDFACING ALLOYS YOURSELF . . . TAKE ADVANTAGE OF THE SPECIAL INTRODUCTORY LOW PRICE OFFER!

For Only $2.95 you receive a trial assortment of *Aircolite* (for oxy-acetylene and electric application) and Airco Electric Self Hardening Alloys, plus instruction sheets for each of these two alloys and a booklet describing the complete line of Airco Hardfacing Alloys.

Since this special price is good for a limited time only, we suggest that you fill in and mail the coupon below . . . NOW! Send it to our nearest office or authorized dealer. On West Coast: Air Reduction Pacific Company. Represented Internationally by Airco Corporation (International).

Mail this coupon today for your Special Assortment of the NEW AIRCO HARDFACING ALLOYS

Key R.S.
Air Reduction, 60 East 42nd Street, New York 17, N. Y.

☐ Here is my check for $2.95 — send me the special package of Airco's Hardfacing Alloys.

☐ Send me your booklet: "Airco Hardfacing Alloys" — at NO cost to me.

Firm_____

Signed By_____

Address_____

City & State_____

AIRCO **AIR REDUCTION**

Offices in All Principal Cities

Headquarters for Oxygen, Acetylene and Other Gases . . . Carbide . . . Gas Welding and Cutting Machines, Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories

WHY HAVE RUST IN DRILLS?

DRILLS LUBRICATED WITH TEXACO ROCK DRILL LUBRICANTS EP ARE FULLY PROTECTED

RUST is a constant threat to drill operating efficiency — and a common cause of high maintenance cost. *Texaco Rock Drill Lubricants EP* protect against these dangers whether your drills are running or idle.

But rust prevention is only one job. *Texaco Rock Drill Lubricants EP* do many others. Their high film strength and adhesiveness protect moving parts against wear. They lubricate effectively even under extremely wet conditions. They resist oxidation and flow readily at all operating temperatures.

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ROADS AND STREETS

March, 1949 • Vol. 92 • No. 3

Editorials

★ Why Hang it on the Contractors?

Not long ago the nation's newspapers carried an item quoting the Public Roads Administration to the effect that the highway contracting industry is operating at full capacity, and can do no additional work. This condition, PRA was credited with saying, is indicated by bid prices, the number of contractors choosing to bid on jobs, and delays by contractors in starting and completing work.

We do not believe that PRA leaders intended such emphasis to this statement, which possibly was lifted out of the PRA annual report by some other organization with a publicity axe to grind.

But for the sake of analysis, is it really true? Are contractors our bottleneck from here on?

If so, we are in the midst of promoting a considerably increased highway program that cannot be carried out. All that the owners of the 41 million cars and trucks that are currently cramming our tired, old road arteries and capillaries can hope for, then, is a continuing retrogression of the road system. For we *are* falling behind alarmingly in road construction, the 1.6 billion dollar volume for 1948 being only half the annual construction pace of 3 billions estimated to be needed for the next fifteen or twenty years.

Contractors' Brilliant Record

Contractors certainly have had plenty of work in most states during these first four postwar years. Right after the war, when congressional hearings were being held in connection with new federal highway legislation, contractor leaders testified that their industry could handle their end of any enlarged road program. In states such as Texas, California and a few others, which have rolled the fastest since then, contractors have been reasonably plentiful, and their prices in general fair for these times. Where contractors have failed to respond to lettings, or have bid too high, the reason was seldom a lack of contractor capacity. It was a lack of incentive, proper "working climate," materials, or some other reason, but not a lack of road-building capacity, which we believe can be expanded to almost any degree once contractors are sold on the outlook for steady, profitable work. California highway contractors, by the way, are reported to have utilized only 8½% of their declared capacity last year.

But times are softening up, and you'll see more spirited bidding on road work in 1949 and perhaps beyond. If contractors were given the jobs they could build much larger road mileages, one contractor association executive agrees in discussing this question; he made only the proviso that materials such as steel and cement be available. He pointed out that a shortage of reinforcing steel isn't a lack of contractor capacity as such. Were supplies to be made readily available, a tremendous increase in highway construction would be possible. Contractors during the war showed a spectacular ability to expand, and in peacetime years of the past also have expanded rapidly to meet the ups and downs of road programs.

Some Short of Jobs

In concurring with these general conclusions, another contractor leader said that the statement credited to PRA is inconsistent with the many inquiries received from his association's members on the availability of work. In some areas during the past year, highway work was so scarce that contractors were obliged to sell their equipment, while in other cases it was necessary for them to move into other states. Recently some contractors have even sought work in areas unfamiliar to them, or even in foreign countries. Such goings-on do not jibe with claims of a lack of ability to expand, and would tend to show that the situation is at least spotty and softening up in some states. With even a mild recession in industrial construction and general business this year, more contracting capacity should be available for road work and material shortages eased.

Let us come back to PRA's position, and to the national highway need. This nation can never hope to measure the great worth of the Public Roads Administration's steady and far-seeing administration of the past three decades. It has given us, to put it simply, the ability to enjoy the motor era. PRA and AASHO leaders, while constantly aiming high and far, have also won the confidence of congressional committeemen since the war by advocating a somewhat conservative program, soundly conceived and carefully documented as to ability of states to match funds. This conservatism, rather than a blind, all-out stand for a sudden vastly enlarged road program, impressed congressmen at a time when they were scared stiff by inflation and worried by economy-minded constituents back home. We got a $450 million dollar annual federal-aid program last summer "by the skin of our teeth," and we have this conservatism to thank for it.

Research Suggested

But all of us have to look at the far-future in road-building. Inflation isn't going to leave us, despite

business adjustments, and no one hopes for much lower costs. Gas tax raises and other new highway revenues are sought this year in a score of states. State-wide engineering studies of highway needs are progressing in several states, and long-range financing and construction programs based on such studies are being weighed in others. What if we were suddenly to have more road building money? State, county and city highway and street officials will then have the problem of sudden expansion. The shortage won't be in contractor capacity, but in engineers.

Road officials can do many things to make work more attractive. In some cases the obstacle is a state law or constitutional clause, as in the case of New York's restriction of work to 40 hours per week on public works projects. In any event, some states are more popular among contractors than others, and it would make a nice little research project to determine why. Clearer field specifications and more consistent field supervision might be one reason. Freedom from political shenanigans another. But the big inducement is the existence of a long-time program of steady assured work.

Commercial building and other private construction will have their ups and downs, but highway construction, taken nationally, is due for a steady upward volume. This just has to be, with people clamoring for road betterment and with highway tax increases in prospect.

To say that road contractors are "full up," and let it go at that, certainly is a defeatist way of looking ahead at a time when highway construction ought somehow to be stepped up to at least twice its present level in the public interest.

★ New Highway Revenues in Sight—in Your State?

Sixteen state legislatures now have bills proposing gasoline tax rate increases. Another state bill proposes to extend a prior increase. Two states have bills which, of all things, propose a decrease in the gasoline tax rate.

These increases are long overdue, and the legislatures that OK them will be doing their states and the road-using public a favor that will last long into the future.

Most of the raises proposed are for one cent additional per gallon. Several other states are considering 1½ or 2 cents. In none of the states involved will enough new revenue be thus obtained to make a serious dent in highway deficiencies. Our highway system is retrograding at an alarming rate, calling for emergency action.

These raises should be voted, even though they represent arbitrary or stop-gap financial measures in most instances. The big need in every state is to undertake a thorough engineering study of highway and street need, and develop a long-range highway plan along with a sound and just long-range financing program. Elimination of the $170 million annual diversion is simply one little detail along the way.

Such program recommendations have been made for 15- or 20-year periods in Oregon, Washington, Michigan, Kansas, Iowa and certain other states. The dollar sums involved are staggering to the engineer and planner, let alone the man on the street. Oregon's 15-year program, based on a thorough study by a legislative interim committee, calls for expenditure of $63 million annually for new construction and maintenance. Over $17 million will have to be realized from new revenue sources, including a proposed 1 cent gallon gas tax increase, doubling of basic registration fee and other relatively painless means.

In acknowledging that the proposed increases in motor vehicle taxes would still be short of the annual programmed requirements, the Oregon report urged that the interim committee be continued and that it seek a workable revenue-producing pattern with exploration in the following areas:

A. Proportionate tax responsibility for the major beneficiaries of highways: the road user, the property owner, and the community.

B. The specific means (income tax, sales tax, general fund or whatever) whereby the community tax responsibility shall be met.

C. Development of an equitable formula for the apportionment of road-user taxes to state, county, and city highway administrations.

D. Exploration of public opinion in the above areas (through public hearings with road user, property and community groups) as a guide and aid in the formulation of an acceptable highway fiscal policy adequate to the needs of the 15-year program as outlined in the engineering study.

Can highway programs be put on the books by such sound means, and periodically received in an equally dispassionate manner? Many think it can, and this year's expedient gas tax raises should be followed up by state-wide studies. What's in sight in your state?

★ ARBA Plans Expanded Activities

The American Road Builders' Association rendered a service to the nation in repeatedly spotlighting the serious lag in road progress throughout its four-day conference in Washington last month. The facts presented there by such authorities as PRA Commissioner MacDonald, AASHO leaders Brown and Hale, Upham of ARBA, and others, need to be amplified until they become a deafening roar. The plan of ARBA to intensify and broaden its public relations program is a move that should get the applause and cooperation of every one in the road field.

★ Dozers and motor graders performed most of the shallow grading necessary

Airport Graded by Volunteers in

One Week-End

Here is an outstanding example of civic enterprise. How citizens of Michigan City, Indiana, "ganged up" with 108 heavy machines and 300 to 500 workers and donated two runways to their community. A "non-technical" account but a dandy.—**Editor.**

By Joseph B. Smith
News-Dispatch, Michigan City, Indiana

IN an outstanding move of community cooperation, citizens of Michigan City, Indiana, donated services and machines—and built an airport "for free" in two days.

Until a volunteer group went to work last December, this was the only third-class city in Indiana without a municipal field. As with many another city, the civic potential in this Hoosier community of 26,000 was long smothered beneath a sluggish lethargy. Residents split into bitter factions over the need for an airport or who should pay for it. The action that resulted in the airport shook off the doldrums. Today an aroused citizenry is looking for other civic projects to which it can devote its newly-discovered energy.

As airports go, Michigan's City's "two-day" airport has no unusual features. More of it still is on drawing boards than on the 150-acre site two miles south of town. But the ground has been broken and the field is safe for any craft up to and including a C-47.

Already there are two runways. Next spring there'll be a third. The N-S strip is 2,500x500 ft.; the NE-SW, 3,000x500 ft.

Both completed runways will be sown this spring with a special deep-rooted grass developed for airports by Purdue University engineers. Pavement of the strips will hinge on government aid and other financing. Erection of hangars and administration buildings also are blueprinted.

The real news from Michigan City lies less in *what* has been done, more in *how* the community did it. The "miracle," as it was termed locally, is the unleashed civic enthusiasm that drew 500 workers and 100 pieces of heavy equipment to the site, and produced a usable field within 48 hours. Actual working time put in before the first plane landed was less than 16 hours.

Behind-Scenes Story

Michigan City pilots had a privately-owned, scarcely developed field they could, however, use. At one time this site had federal and state approval. Within the last few years, as aviation developed, the site was adjudged unfit and hazardous.

In mid-1947 CAA offered city officials $40,000 if the city spent $60,000. Pilots promptly circulated a $60,000 bond issue petition. City councilmen shelved the petition during a municipal election. It came up for consideration early in 1948, but was overwhelmingly slapped down by a remonstrance.

The night that happened, elsewhere in the city a group of aviation enthusiasts banded together into what they called the Booster club. Their aims were to bring industry to the city, advertise and exploit the natural vacationland facilities provided by sand dunes and Lake Michigan—and get an airport. When owners of the existing private field gave notice they were parceling the land for sale, Boosters were stirred to quick action.

President M. B. Wilson named Nathan Winski aviation chairman and told him to present a feasible airport plan soon. Within a few days Winski talked with aviation experts and city officials. He came up with this plan which Boosters accepted immediately:

Plan of Action

1. Boosters would form a non-profit corporation, sell $35,000 in stock to local firms and individuals, and acquire the federally-approved site near the city.

2. Once owning the field, Boosters would enter into a 7-year lease with the city which ultimately would repay

★ Stumps were hauled to ravine dump a mile from the site. Here a single axle unit crane with a half-yard bucket loads a 5-yard Chevrolet truck on the "stump-disposal run"

all stockholders. Title could be transferred to the municipality. There would be no interest charged. The city's annual budget already included a $7,000 item for aviation. Most of this could be used for the rental.

3. Boosters would organize a big week-end work party to put undeveloped acreage into usable condition for aviation.

Mayor Russell Hileman and other city officials were delighted with the plan. It offered them a usable, partially developed field without obligating them to increase taxes. Immediate Booster and city legal authorities checked statutes and sought an opinion from Attorney General Cleon Foust on the plan's legality. There were no legal objections.

Booster President Wilson then appointed Ralph Surface, works manager in a local factory, as airport work supervisor. It was the latter's job to plan the work, secure the volunteers and equipment, and present the city with a cleared and graded airport.

Surface visited the site two days later with Col. C. W. Cornish, state aviation chief. The two of them decided what must be done.

Tree Removal First

Before any other work could be started, they agreed, two tree lines that intersected in the field's center had to be removed. That meant uprooting 350 elms and oaks. The NE-SW runway would hit a woods patch. Those trees would have to be removed, also.

Where the three proposed runways would meet, there was a rolling ridge. Its top would have to be graded down about two feet. Just behind it was a depression which needed filling. Then there was grading and seeding of the first two runways.

"Our first step was to analyze the job," Surface said later. "We prepared maps and charts of the site, including large-scale drawings of every tree that had to come out, every mound that needed grading."

"Then we measured our tools—that is, the manpower and equipment we could expect. We paired these two with the work. Finally, we arranged a time schedule in order to get maximum usage from men and equipment."

How Work Was Organized

That timing element was important. For example, most men and material were concentrated the first hours in taking out the N-S tree line. Graders spent those first hours leveling bumps, and once the trees were out, completed the leveling.

A large field kitchen was organized. Doctors and an ambulance were volunteered in case of emergency. An insurance company underwrote the project, completely covering any registered worker. A supervisory headquarters was set up.

Two 2-way radio systems for central control were volunteered. One came from a taxicab company, the other from an excavating firm which used radio dispatching. Both were used. Radio-equipped cabs and trucks relayed instructions from headquarters.

In rounding up workers, cautious Boosters hoped for 200 volunteers, and perhaps 30 pieces of equipment. Most workers were originally slated to help cut up trees and stumps, which were to be hauled into corners of the field, the logs for sale, the stumps as waste. Brush was to be burned.

Once farmers harvested their crops off the site, Boosters made final plans. They set December 4 and 5 as the two days for their work party.

First Day Dawns Wet

Although the first day dawned foggily, workers poured out to the field. They came from 50 miles around. Many brought unexpected equipment.

Because of their conservatism, Boosters had planned on finishing only one runway in the two days, but

★ Ralph Surface, right, the project's boss and planner, going over blueprints before the job with an aide. Charts on wall gave the size of every tree that had to come out

★ Grading work on the N-S runway

★ Some trees needed no dynamite

by noon the first day, some 500 men turned up. Instead of 30 pieces, there were 108. Shortly before noon some bulldozers were able to begin grading the second runway. Other 'dozers and the dynamite crew set to work toppling the big timber patch. The first night Project Boss Surface was able to look over the job and pronounce it three-fourths completed. The remainder could be wrapped up easily Sunday.

All night long, however, rains worked on the newly-turned clay, converting it into a quagmire where tractors could scarcely move. Completion plans were postponed a week until the following Saturday, when grading was finished on the first two runways.

While most volunteers by-passed the registration tent on the first Saturday, some 270 signed up. In all, 43 firms were represented with equipment, but the bulk of cranes, 'dozers, and heavy trucks came from 7 or 8 larger companies. The balance was represented by small trucks, jeeps and power saws used to cut up felled timber.

$60,000 Contribution

Surface submitted careful statistics to Boosters at the year's end. He figured the 1½-day work party was worth slightly more than $10,000. To arrive at this, he figured on 2,072 man-hours, worth $3,418.80, and placed equipment rental at $9,093.80. To be conservative, man-hours were figured on the basis of 270 men registered, although nearly double that had turned out.

These figures will be added to the $35,000 land cost and to other work scheduled for the future. Eventually the total will near $60,000, and when it does, the city will report to CAA in hopes of receiving the promised $40,000, to be used for paving.

Meanwhile, Michigan City taxpayers have the beginnings of an airport, and it hasn't cost them a dime more than they had to pay without it.

Safety Program in Kentucky

Allocation of $1,000,000 each year for removal of highway traffic hazards will be recommended for inclusion in Kentucky's 1949 highway department budget. The money will be used to correct road and bridge danger spots where accidents occur most frequently as indicated by the new uniform accident reporting service.

"A specially-trained engineer has been assigned to check all accident reports to see if there is any indication that the condition of the road was the cause of, or a contributing factor, to the accident. Pertinent reports are referred to the proper engineering divisions for careful study and recommendation for corrective measure," Dwight H. Bray, state highway engineer, said. "Where accidents are repeated and where no other cause can be determined, we will study the possibilities of re-alignment and new road locations.

"Of course, every year, hazardous highways are rebuilt, relocated or generally improved from a safety standpoint. The new fund would be set aside for the specific purpose of providing immediate relief for the very worst places.

"Public cooperation in helping to correct highway traffic hazards will be appreciated since many minor accidents are not now reported. A series of small accidents might, eventually, develop a major casualty.

Quite an Outfit!

Equipment which, with operators, was volunteered and used on the Michigan City job:

Dump Trucks
2 International M5H6, 12-ton, 6-wheeler
1 International HB11F, 15-ton
7 Chevrolet, 5-yard
3 Ford, 4-yard
2 Federal, 4-yard
2 GMC, 4-yard
1 Dodge, 4-yard
1 Chevrolet, semi-, 16-yard, detachable dump

Motor Graders
2 Allis Chalmers
2 Caterpillar No. 12

Scraper
1 Caterpillar No. 70

Winch Trucks
1 International KB11
1 International DS40

Bulldozers
2 International TD 18
1 International TD 14
2 Caterpillar D 6
1 Caterpillar 30
1 Allis-Chalmers HD 7

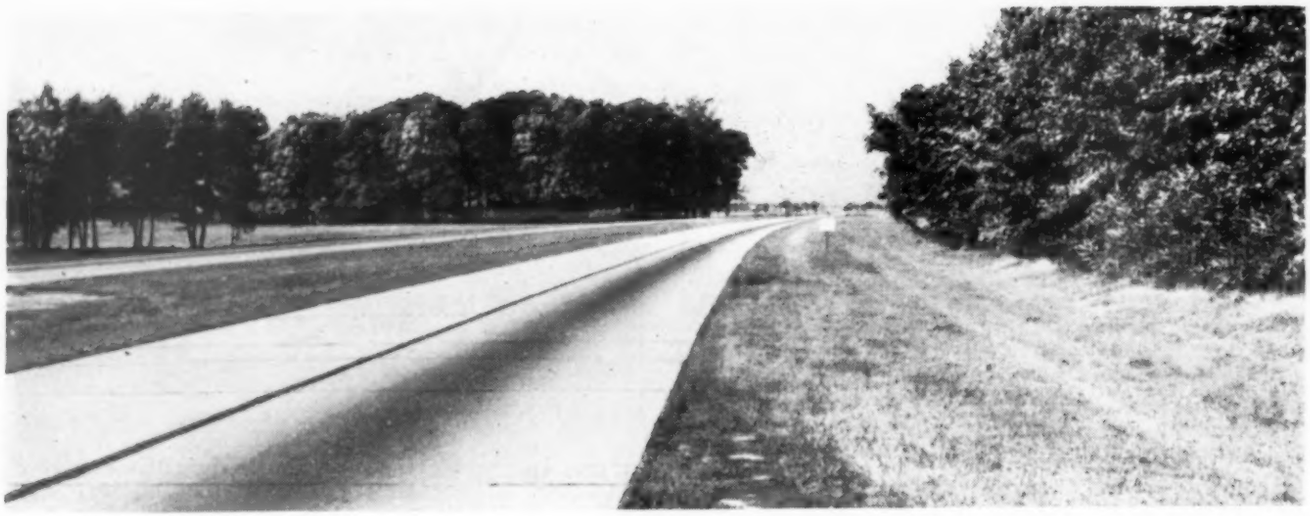
Cranes
2 Michigan TLDT 20 track or tandem
2 Michigan K6 single-axle
1 Michigan TK6 power shovel, 6-ton
1 Unit ½-yard crawler
1 Unit ½-yard tandem
1 Diamond T 4-ton boom truck

Trailers
3 International KB 11 25-ton, low boys
1 International Trail-Mobiles
1 International K5 800-gal. tanker (full for servicing)

Miscellaneous
1 Oliver Hi-Lift, HG 42 with ATECO loader
1 Dual sheepsfoot roller
1 Sullivan, 120-lb. air compressor
2 Chevrolet one-ton service trucks
1 GMC custom-built rigging truck

In addition to these there were more than a dozen stake trucks of all makes and sizes. There was one unidentifiable semi-trailer flat-rack procured as surplus from the Army. Seven power saws of various descriptions were volunteered. Other volunteers brought with them some 10 pickup trucks representing various manufacturers.

Three radio-equipped taxicabs and nearly a dozen pieces of heavy equipment included above belonging to an earth-moving firm also were radio-equipped.



★ Fig. 1. U.S. 30 in Northern Indiana

Salvaging a Pumping Pavement

This case report, covering a section of U.S. 30, Indiana, gives detailed procedures on the use of cement slurry mixtures for undersealing, and discusses the broad problem of salvaging failing pavements

By W. H. Goetz

Research Engineer, Joint Highway Research Project, Purdue University, Lafayette, Ind.

UNDER the combined action of water and heavy traffic, concrete pavements constructed directly on fine-grained soils continue to deteriorate at an alarming rate and many states have found it necessary to spend large sums in attempts to remedy the problem (1).* Depending upon the extent to which the pumping action has progressed and the degree to which the pavement has deteriorated, many corrective treatments have been applied. Among these may be listed: the installation of edge drains (2), mudjacking with mixtures of soil, cement and/or bituminous materials (3), subsealing with asphalt cement (4), skin-patching with bituminous-aggregate mixtures and joint sealing, resurfacing with bituminous mixtures or concrete, and complete removal and replacement (5). In new construction of concrete pavements over fine-grained soils, granular base-courses are being used extensively and expansion joints are being used less frequently (6).

The dual lane pavement of U.S. 30 in northern Indiana, constructed on the plastic, silty-clay soils of the Valparaiso moraine, has been showing progressive distress from pumping since 1940 (1, 6). This pavement is 9-7-9 in section, constructed in 1937; the slabs are reinforced with steel mesh and expansion joints are spaced at 40-ft. intervals. No contraction joints were used. In 1942, a two-mile section of this road was selected for treatment on an experimental basis by mud-jacking with various soil-cement-bituminous-material mixtures (3). By 1944, the maintenance problem had reached the stage where it was decided to install 6-in. longitudinal drains at an approximate depth of 3 ft. along the outer edge of both lanes of a major portion of the road located in the Valparaiso moraine and backfill with porous granular material (2). This measure was only partially effective and in 1945 sub-sealing with hot asphalt cement was tried on an experimental basis. The operation proved hazardous and a cold mixture was sought for the purpose. There followed the development of a quick-setting cement slurry (7, 8) to be used for filling voids under the pavement in order to stabilize the pumping slabs. Present operations on U.S. 30 include the use of this material.

The condition of this pavement prior to salvage operations is recorded in four photographs. Fig. 1 shows a view of this road in a sand area just outside the limits of the Valpariaso moraine. Performance here is good except for some faulting of the joints due to consolidation of the sand. Typical performance on the plastic silty-clay soils is shown in Fig. 2. The pavement is in an advanced state of failure as shown by the extensive pumping, large amounts of faulting, and many areas where the concrete slab is badly broken. Close-up views of this damage are shown in Figs. 3 and 4. Salvage of this pavement is being accomplished by the following series of operations:

1. Placing concrete patches in areas where the old pavement is badly broken.
2. Stabilization of all remaining pavement slabs with cement slurry.
3. Resurfacing with 3 in. of asphaltic concrete and rock asphalt.

Field Procedures

Concrete to be removed is marked as shown in Fig. 5 and the pavement cut by means of a pneumatic chisel

*Numbers in parentheses refer to references at the end of the report.

The cement-slurry mixture was developed in the laboratories of the Joint Highway Research Project, Purdue University, and applied experimentally in the field by engineers of their staff. Those responsible for this development and application include W. H. Goetz and F. H. Green, Research Engineers, and K. B. Woods, Associate Director, Joint Highway Research Project. Illustrations courtesy of the Joint Highway Research Project.

★ Fig. 2. Severe pumping of the silty-clay soils in the Valparaiso Moraine

★ Figs. 3 and 4. Badly broken, faulting pavement resulting from pumping

as shown in Fig. 6. This section of pavement is then completely broken by a truck-mounted falling weight pictured in Fig. 7. After the slab is broken, a drag-line moves in to remove the broken concrete and to excavate the plastic soil to about 6 in. below the bottom of the concrete. Hand methods are necessary to finish this operation and to shape the hole. See Figs. 8 and 9. As can be seen, patching is extensive in this area of shallow cut. The patching operation consists of setting the form and backfilling with about 6 in. of dune sand shown in Fig. 10. Some difficulty has been experienced in compacting this dune sand sufficiently for good performance and the use of a thinner layer is being advocated. The patch material is ready-mixed concrete, shown being placed in Fig. 11.

Following the patching operations, the old slabs are stabilized by pumping a water-thin cement slurry through holes drilled in the pavement to completely fill the void created by the action of the pumping slabs (8). No attempt is made to correct faulting. Holes to be drilled are marked in advance and then drilled with a pneumatic drill. Usually four holes are drilled in each traffic lane at each joint and crack, two on each side of the joint or crack. In addition, holes are drilled wherever it is thought that they might be necessary. This procedure results in an excessive number of holes and many of them are not pumped because they are filled by pumping operations in adjacent holes. However, since drilling cost is a minor item, it is deemed wise to drill enough holes to assure complete filling of the void by the cement slurry. Fig. 12 shows the hole-drilling operations.

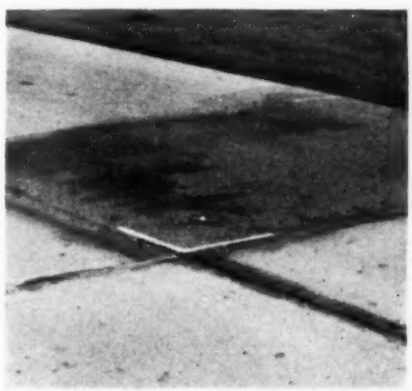
In Fig. 13 is shown a water wagon equipped with a gasoline-powered pump and a 4-wheeled platform on which is mounted a mortar mixer, both being towed by a truck carrying the cement supply. A special cement-slurry mixture is used which is composed of standard portland cement, calcium-aluminate cement and water (7). The proportions used are adjusted, depending upon weather conditions and the particular cement being used, to produce a mixture almost water-thin initially and which will retain this initial consistency for a period of several minutes. Properly proportioned mixtures begin to thicken in about 10 min. and reach a heavy consistency in about 15 min. In 20 min. they have set without bleeding, and are firm in not more than 30 min. Hardening then continues for several days.

In Fig. 14 a four-bag batch is being discharged from the mixer into a concrete buggy which carries the slurry to the pump. A 4-bag batch and two concrete buggies will supply two No. 10 Koehring pumps. The slurry is ladled from the buggy to the hopper of the pump as shown in Fig. 15. Pumping is continued until the material is forced from under the pavement along the edge, flows from the openings in the joint or crack, or the pavement slab starts to rise. When the nozzle of the pump is removed from the hole at the end of the pumping operation, the thin slurry flows back as shown in Fig. 16 and it is necessary to plug the hole temporary with a wooden plug. Fig. 18 shows a section of road on which the slurry-pumping operation has just been completed. Holes are easily located by the position of the wooden plugs.

After about 15 min. or less, the plugs may be removed since the slurry has thickened as shown in Fig. 17, where the surface of the excess slurry has been marked with the finger. The operation is completed by filling the holes with slurry after removal of the wooden plugs, and scraping excess material from the pavement.

Over 100 Bbl. per Day

The slurry treatment operation, including the drilling of holes and using two pumps, requires 9 men and a foreman. This crew has pumped as much as 140 bbl. of cement in an 8-



★ Fig. 5. Pavement marked for removal and patching

★ Fig. 6. Cutting pavement for removal

★ Fig. 7. Breaking pavement for removal

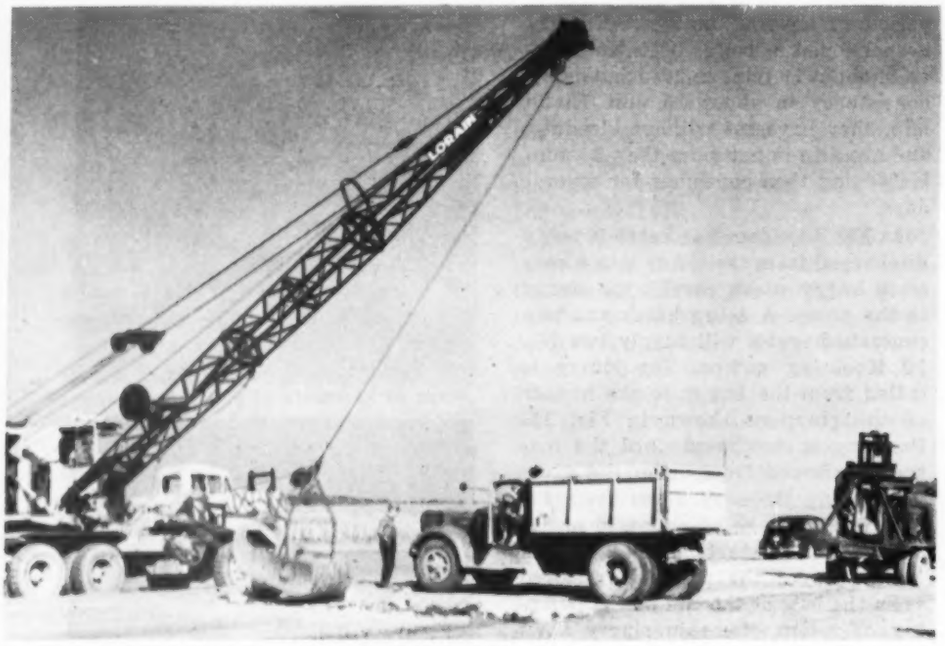
hour day and has averaged 100 bbl. per day over a 6-day week.

Resurfacing operations follow the stabilization process with cement slurry as closely as is practical. Preferable procedure is to complete the resurfacing operations of the patched and stabilized pavement before traffic is allowed on the road. If this is impractical, attempts should be made to correct the worst faulting through lifting of the slabs in conjunction with slurry treatment or by means of skin patches.

This salvage work is being done under two contracts, one 6.77 mi., and the other 15.98 mi. in length. In one section of 5.72 mi., 2,278.5 bbl. of portland cement and 393 bbl. of calcium aluminate cement were used and 16,965 holes were drilled. Contract units for the slurry treatment are barrels of portland cement, barrels of calcium-aluminate cement, and per-hole drilled. The Rocks Roads Construction Company of Chicago is the general contractor on this job and the cement-slurry pumping has been subcontracted to the J-P Construction Company of Chicago Heights, Ill. State Highway Commission of Indiana personnel responsible for the plan of these salvage operations include A. O. Hastings, superintendent of maintenance; D. G. Goodwin, district engineer at LaPorte; P. E. Kunz, field engineer of maintenance, and W. T. Spencer, soils engineer, Department of Materials and Tests.

★ Fig. 9. Completing removal with hand labor

In conclusion, it should be pointed out that while the cement-slurry material being used is a new development, its performance as a void-filling material on pumping pavements has been observed over a two-year period and results have been generally satisfactory. As is the case with other materials which have been used for this purpose, the cement-slurry material in itself does not offer a complete cure for the pumping problem. Like cancer in the human, the pumping disease affecting concrete pavements is best controlled if detection is early and the corrective treatment is applied promptly.



★ Fig. 8. Removing pavement and soil with dragline

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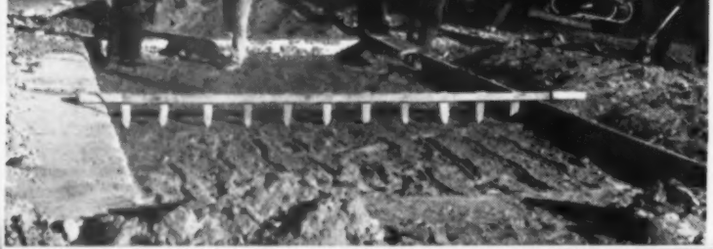
★ Fig. 10. Placings sand backfill



★ Fig. 11. Patching with ready-mixed concrete

★ Fig. 12. (Right) Drilling holes for stabilization of slabs with cement slurry

★ Fig. 13. (Above) Mixing and placing cement slurry

★ Fig. 14. Discharging cement slurry from mixer

★ Fig. 15. Ladling cement slurry into pump hopper

★ Fig. 16. (Left) Wooden plugs are used to prevent the cement slurry from flowing back from the hole at the completion of the pumping operation

★ Fig. 17. (Right) When the cement slurry has thickened sufficiently the plugs may be removed, the hole filled with slurry and the excess slurry removed

★ Fig. 18. (Below) Wooden plugs mark the position of holes on which the pumping operation has been completed

5. "Maintenance Methods for Preventing and Correcting the Pumping Action of Concrete Pavement Slabs," *Current Road Problems No. 4-R* (Revised Edition), Highway Research Board, September, 1947.
6. Henderson, E. A. and Spencer, W. T., "The Effect of Subgrade Treatments on the Performance of Concrete Pavements," *Proceedings*, Highway Research Board, Vol. 26, 1946.
7. Goetz, W. H., "Development of Cement-Slurry Mixture for Use in Correcting Pumping Pavements," *Proceedings*, Highway Research Board, Vol. 27, 1947.
8. Green, F. H., "Treatment of Pumping Pavements with Cement-Slurry Mixtures," *Proceedings*, Highway Research Board, Vol. 27, 1947.

American Roadbuilders' Meeting Focuses on

Critical Highway Need

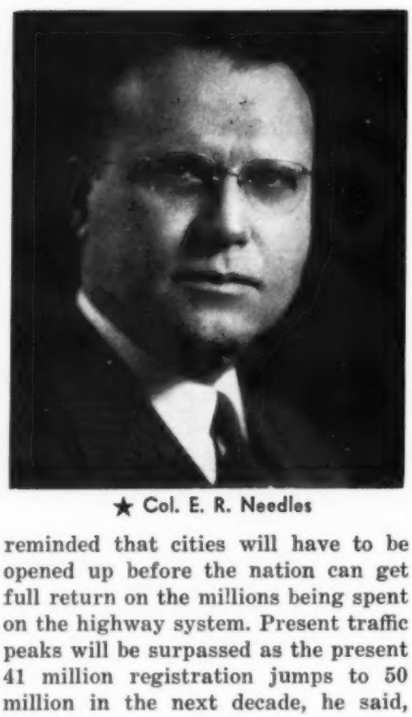
Mounting highway deficiencies, financing problems, and top-level policy and administrative questions received attention along with technical committees at the ARBA Conference in Washington

AN air of serious national emergency existed at some of the sessions of the American Road Builders' Association Conference, held February 7-9, Washington, D.C. And the growing tension is well founded, if the statistics are true. Various speakers, including congressmen and senators as well as state, county and city road officials, told of the need for vast sums to rehabilitate and modernize our highway system.

While all agreed with the Hon. John J. McClellan, chairman, Senate subcommittee on roads, that "The Need for roads is nowhere challenged," opinion was split on where to put the emphasis. Tremendous pressure is being brought on congressional leaders today to provide more funds for local and secondary roads, which Representative J. Harry McGregor (Ohio) championed by stating that 23% of the 3,000,000 miles of roads in the rural districts are still unsurfaced, while 31% are primitive roads not even properly graded and drained. Other speakers also pleaded for more funds for local roads.

Improve Arterials First

An authoritative picture in a different direction was presented by Major General Philip B. Fleming, who



★ Col. E. R. Needles

reminded that cities will have to be opened up before the nation can get full return on the millions being spent on the highway system. Present traffic peaks will be surpassed as the present 41 million registration jumps to 50 million in the next decade, he said, adding that our highway transportation system in congested areas will break down completely if we do not act soon to provide for fast and safe movement of large volumes of traffic. He urged that slum clearance be linked with urban arterial development and that city arterial highways not be allowed to become little more than city streets.

Nearly 97% of all motor traffic is within 30 miles of cities and towns of 2500 population or over, is another way of putting the problem of arterial emphasis. Public works committee chairman Whittington of the U.S. House of Representatives, who made this statement, also cited the present federal highway act as the soundest and most constructive federal highway law ever enacted, in that it considers arterial, secondary and urban highways, with responsibility for an integrated system centered in the state highway departments.

Not Gaining on Problem!

Perhaps the most telling facts on overall highway need were presented by Charles M. Upham of ARBA. We must resurface 13,000 miles of primary and 27,000 miles of secondary roads each year just to tread water, he noted. Truck traffic which has risen, until today 50% of all commodity movement is by highway, is accelerating the wearing out of our roads.

Warns Against Dispersion

Another statement in behalf of an adequate arterial program, amounting to a grave warning, came from Hal H. Hale, executive secretary, American Association of State Highway Officials. Hale presented a paper by the AASHO's president, Carl Brown of Missouri. In characterizing our highway system as the "greatest man-made structure in the world," he observed that primary roads are the system's backbone; all users of all roads use the primary roads. This 233,000-mile "main stem" system is only 40% paved and nearly half of its improvements are 20 years old or older.

Mr. Hale emphasized three points:

(1) Dispersion of road funds to local roads is a serious threat and should be prevented. The public thinks that there is an unlimited amount of funds

★ (Left to right): Charles W. Smith, Pensacola, Fla., vice-president, Charles M. Upham, engineer-director, Washington, D.C.; J. T. Calloway, Chicago, retiring president, shakes hands with Col. Enoch R. Needles, New York City, new ARBA president; Paul B. Reinhold, Pittsburgh, Pa., vice-president, Northeastern District

for all kinds of roads. Actually out of the $1,839,000,000 collected from all sources by the state highway departments in 1947, less than one-third was available for new construction. $74 million went for collection costs, $171 million to non-highway use, $160 million to local or city governments, $368 million for state road maintenance, $152 million for debt service, $132 million for administration, and $46 million to the highway patrols, leaving only $572 millions for construction.

(2) Toll road trends continue to cause concern among highway leaders. Bills are up before several state legislatures proposing toll projects. Mr. Hale, speaking his personal opinion rather than for the AASHO, emphasized that (a) toll roads aren't the golden bonanzas painted; (b) cannot be competitive with comparable free facilities, and once built stifle parallel free facilities; (c) cannot effectively serve the bulk of the area's local traffic; and (d) a connective system of toll roads isn't in the cards.

(3) The problem of limiting sizes and weights of commercial vehicles. The highway user is being sold down the river by certain organizations supposedly representing user groups, Hale, who wants economical, safe transportation for his tax dollar, inferred. (Commissioner MacDonald's discussion summarized farther on in this report.)

(4) The problem of engineering personnel in the highway departments. Staff ranks today are 50% short, and 15,000 men could be utilized at once. Spending of tax funds for adequate salaries to attract and give careers to competent engineers, represents one of the best public investments, since it insures fullest results from the remainder of the funds spent.

Engineer Training Spotlighted

Charles M. Upham of ARBA, also discussed the personnel and salary question, calling pay rates the crux of the problem. However, attracting and training young engineers is receiving greater consideration today. Virginia and West Virginia, for example, have excellent programs for linking engineering college courses with the highway department. Professor Ben H. Petty of Purdue University spoke at another session on a phase of this subject, namely, the opportunities and benefits of highway short courses given by the engineering schools. And C. R. Hanes, heading up a committee on the advancement of highway engineering, presented a report under the ARBA's Educational Division, headed by Professor A. Diefendorf of the University of Utah.

Trucks—What Limit?

Commissioner Thos. H. MacDonald, veteran PRA chief, chose as his main topic the serious policy question of truck limits. He noted that while we have reached a high state of development in highway design and construction, we have a shabby record of educating the public to the proper use of highways. Misuse, whether it be in the form of irresponsible driving, bringing sudden tragedy, or overload bringing road destruction, challenges our best thinking today and calls for selling the general public and highway user groups on fuller cooperation. The highway system is for all the people, noted Mr. MacDonald, and should be planned for the whole public service.

Highways are misused when numerically overloaded to the danger point, or when structurally overloaded by overweight vehicles, and either form of misuse brings on excessive costs and is a mark against the highway planner, said the Commissioner. The highway user is concerned because he pays the bills. This year highway officials must make the important decision of whether to hold the line on present-day axle load limits, or permit increasingly heavier loads. Truckers and truck manufacturers want to know future policy, so that they can adopt long-range plans. If granted increased loads, truck interests must

(*Continued on page* 97)

★ (Left): Donald O. White, retiring president, ARBA contractors' division, shaking hands with president-elect Nello Teer. (Right): W. B. Greene and R. K. Stiles, retiring and incoming president, respectively, of ARBA's manufacturers' division

ARBA Officers and Directors for 1949

President: Col. E. R. Needles of Howard, Needles, Tammen and Bergendoff, consulting engineers, New York, succeeding J. T. Calloway of Chicago who held the presidency for two terms.

Regional Vice Presidents: (re-elected) Paul B. Reinhold, pres., Atlas Equipment Co., Pittsburgh, Pa.; Charles W. Smith, pres., Smith Engineering and Construction Co., Pensacola, Fla.; W. A. Roberts, executive vice-president, Allis-Chalmers Mfg. Co., Milwaukee, Wis.; and T. E. Stanton, materials and research engineer, California Department of Public Works, Sacramento.

Treasurer: (re-elected) Jennings Randolph, assistant to the president, Capitol Airlines, Washington, D.C. Directors: (3-year term) Paul L. Andrews, executive secretary, Georgia Highway Contractors Association, Atlanta, Ga.; Robert B. Brooks, consulting engineer, St. Louis, Mo.; Bernard Gray, Asphalt Institute, New York, N.Y.; Robert N. Reindollar, chairman, Maryland State Roads Commission, Baltimore; Paul B. Rynning, Jackson County Highway Engineer, Medford, Ore.; Charles H. Sells, consulting engineer, Albany, New York; and A. R. Taylor, consulting engineer, Koppers Company, Pittsburgh, Pa.

Airport Division: Jennings Randolph of Washington, D.C., re-elected president. Vice-presidents: Brig. Gen. T. B. Herndon, chief Aeronautics Division, Baton Rouge, La. (re-el.); O. J. Porter, consulting engineer, Sacramento, Calif. (re-el.); Maj. Gen. C. R. Moore, Baltimore, Md.; E. E. Bently, engineer-manager of airports, Jacksonville, Fla.; Robert Dewey, dir., Illinois Department of Aeronautics, Springfield; J. D. Ramsey, director, Nebraska Aeronautics Commission, Lincoln; Frank W. Wiley, Montana Aeronautics Comm. Helena.

Contractors Division: Nello L. Teer, Jr., of Nello L. Teer Company, Durham, N.C., was elected president, succeeding Donald O. White of Chicago. J. D. Bonness, pres., Joseph D. Bonness, Inc., Milwaukee, Wis., vice-president.

County Division: Allan N. Buck, superintendent of highways, Macon County, Decatur, Ill., was elected president of the County Highway Officials Div., succeeding Ben T. Collier, Clarksdale, Miss. Vice-presidents: (re-el.) L. P. M. Gaylord, Lewis County, Lowville, N.Y.; A. W. Hinderman, Louisa County, Wapello, Ia.; Chris P. Fauerso, Wasco County, The Dalles, Oregon; (new) Scott Candler, DeKalb County, Decatur, Ga.

Municipal Division: H. H. Kranz, city engineer, Cincinnati, elected president succeeding J. B. Wilson, Louisville. Vice-Presidents: (re-el.) H. F. Clemmer, District of Columbia; D. L. Erickson, Lincoln, Nebraska; W. E. Sheddan, Jacksonville, Fla.; W. N. Frickstad, Oakland, Calif.

Manufacturers' Division: R. K. Stiles, executive vice-president, Austin-Western Company, Aurora, Ill., was elected president to succeed W. B. Greene, president

(*Continued on page* 97)

An Ominous Drought

By Halbert P. Gillette

THE *New York Times* recently quoted Jerome Namias of the U.S. Weather Bureau as saying: "We can't put much stock in weather cycles. We can't prove their existence today and maybe we'll never be able to." Coming from the chief of the Bureau's extended forecast section, this is an amazing statement, for many cycle researchers have independently established the existence of numerous cycles. The inability hitherto to use them successfully for forecasting weather from season to season, or week to week, has been due partly to the large number of cycles and partly to their different effects in different regions. Furthermore, until recently the lengths and dates of many cycles had not been accurately determined.

Although the number of short cycles is great, there are relatively few long ones. By long cycles I mean those whose intervals between maximum effects are 200 years or more. Those are the cycles that have the greatest amplitudes, or maximum departures from a mean, and also cause the most prolonged warm-dry and the most prolonged cold-wet epochs. The Glaciation or Ice Age Cycle exemplifies an extreme both of amplitude and duration of a cycle whose length (interval between maxima) is of the order of 150,000 years, and whose last maximum, or peak, was about 20,000 years ago.

I have found that the longest cycles have lengths each of which is thrice that of the next shorter one, and that they are harmonic; that is to say, the maxima of the shorter cycles are coincident with maxima of longer cycles in this dominant triplex series of climatic cycles.

To find this series of cycles it was necessary to study geological records. As an example the accompanying photograph will serve. Here are a few of 32 pairs of white and black beds of rock that have been tilted from their original horizontal position. In these beds are thin laminae, called varves, that were deposited annually. They resemble treerings in being thicker when rainfall and runoff were heavier. Short weather cycles of the same lengths as those in treerings have been found in rock varves, as well as in mud varves in existing and ancient lake beds. Thus we know that they are annually deposited layers.

Each pair of white and black beds records a climatic cycle. Since the average thickness of these 32 pairs is 4.5 feet, and since the average thickness of the varves is 11 to the inch, the climatic cycle here recorded is about 600 years long, that is from extreme warmth to extreme warmth. The white beds are calcareous, that is, they contain calcium carbonate which in its pure form is limestone. All soil contains calcium carbonate, some of which is leached out by rainwater, for calcium carbonate is slightly soluble in water containing carbon dioxide. This carbonic acid gas exists in the air and is dissolved by rain, thus producing a weak acid which, in the course of ages, has cut great caverns in limestone in many regions.

Delivered to the sea by streams, the weakly carbonated water floats on the denser seawater, and is thus exposed to the sun's rays which evaporate some of the carbon dioxide and cause precipitation of calcium carbonate. That is why a rock varve often has a very thin white lamina that records the summer phase of the annual cycle. On a grander scale, when there was long recurrence of warmer years with intensely hot summers, thick beds of calcium carbonate were precipitated. In some cases it was mixed with mud to which it imparts a whitish color; in extreme cases, when the streams were low and carried little silt, pure limestone resulted. It is important to understand how these paired white and black beds were formed, for thus we know that we are looking at the effects of a dominant climatic cycle when we see such a series of beds as those here shown. Consult U.S. Geological Survey, Professional Paper 158, by W. H. Bradley, published in 1929. Having thus found a climatic cycle of about 600 years, I noticed that every third pair often had thicker white beds, indicating a cycle of about 1800 years. I found also that, about 14 or 15 feet apart, beds of sandstone often occur, evidently recording the wet phase of the 1800-year cycle; and that every third bed was thicker, thus recording a cycle of 5400 years.

In a forthcoming booklet on cycles, evidence of these and longer triplex series of cycles, as well as those shorter than 200 years, will be presented. Evidence as to the dates of their maxima and minima ("peaks" and "valleys") will be given. A copy of this booklet will be sent on request. For the present it will suffice to indicate one way of dating the peak and valley of the 1800-year cycle, hence the 600-year and 200-year cycles also.

European glaciers made their greatest recorded advance about the close of the 17th century. The Thames at London froze solid enough to support horses in 1684 and 1685, an event without subsequent parallel. About 900 years earlier, as the Nileometer records at Cairo show, the annual maxima (floods) and annual minima were less for years than they had been before or since. Those records are known back to A.D. 622, and have no break till 1470. They also show the 200-year cycle very well. Del Valle called it 210.

By means of Lake Saki varves and treerings, I have found rainfall cycles of exactly 22½, 67 and 201 years, and evidence of longer cycles in this triplex series. These shorter cycles indicate a peak of the 603 and 1809-year cycles in 1682; hence, the next

(*Continued on page* 80)

PITTSBURGH

- **Penn-Lincoln Parkway to extend from business center eastward for 9½ miles; being planned to include most complicated interchange in highway history**
- **Six construction contracts totaling over $21 million in progress or completed in suburban areas, with tunnel and structures playing major role to date**
- **Dramatic traffic relief eventually promised for one of World's most congested cities, under cooperative program made possible by Federal Aid Highway Act of 1944**
- **Limited access construction eventually to extend 28 miles along East-West axis through city. Western extension of Pennsylvania Turnpike will bypass metropolitan area**

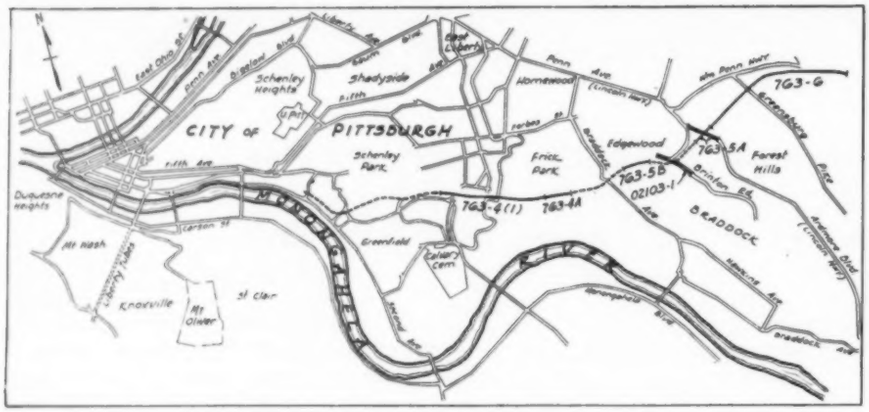
By Harold J. McKeever
Editor,
ROADS AND STREETS

PITTSBURGH, synonym for steel, is also famed for another commodity of modern times—traffic congestion. Into its half-mile-square jungle of skyscrapers known as the Golden Triangle, hundreds of thousands of people daily make their way by car, bus or truck. The downtown traffic problem is made more complicated by the region's rugged terrain, by the presence of railroad terminals and heavy industrial developments, and by the fact that the Triangle is located at the confluence of two much-bridged rivers, the Allegheny and the Monongahela.

Solution Long Sought

For many years local authorities have agreed that first priority should go to developing a limited access highway on the East-West axis, eastward from the business district to connect with U.S. 22, U.S. 30 and the Pennsylvania Turnpike. Serious studies for this route began in 1943 (R&S June, 1944). A problem in Pittsburgh, as in most metropolitan areas, was the one of getting the many corporate agencies together on a joint program. This problem was largely solved by the passage of the Federal Aid Act of 1944, which earmarked federal funds for urban arterials on a state matching basis. With the enactment in May, 1945, of special enabling legislation, the way was cleared for the Pennsylvania department of highways to assume direction of an urban expressway

★ Arch rings completed and approach spans under construction for 980-ft. concrete bridge on Pittsburgh's Penn-Lincoln Parkway. This $1,800,000 structure over Nine-Mile Run leads directly into the $14,000,000 Squirrel Hill Tunnel, also under construction



★ Showing location of the Penn-Lincoln Parkway East with respect to the Pittsburgh area, and location of the six projects described herein

construction under a county-city-state-federal cooperative program. One benefit was the provision in the federal act allowing funds for the elaborate and costly advance engineering necessary for such a complicated project.

The expressway now beginning to take form is called Penn-Lincoln Parkway, which will eventually extend some 28 miles west and east of the Golden Triangle.

Alternate Routes Studied

Only the 9½-mile Penn-Lincoln Parkway East will be discussed here, and only the engineering highlights will be noted. Six principal arterials, converging on the downtown business district, carry most of the traffic from the large suburban area to the east. These arteries carry every kind of traffic, and all are totally inadequate, being complicated by parking, by heavy flows of cross-traffic and pedestrian traffic. Data were compiled and exhaustive studies made from all sources including a county-wide O-D survey made in 1937 by the Pittsburgh Department of City Planning, the city's Bureau of Traffic Planning, Allegheny County's Traffic Division, and the Penna. Department of Highways. A supplementary O-D survey was made in 1945 by the highway department primarily to obtain traffic information necessary for the Design of the Downtown Interchange.

Among other general findings was that traffic volume had spurted 33% in the decade ending in 1941, and would probably increase another 33%. Also that a relatively small number of motorists and truckers is headed *through* the congested district, and would welcome a chance to pass around it.

The Second Avenue location was selected among three routes studied with respect to many economic factors. Design standards were then developed for a 4-lane highway from the eastern end to the location of an important interchange (Forward Avenue), located at the west portal of a large twin tunnel required (Squirrel Hill); then 6-lane construction to the downtown interchange. This interchange system will stretch along Water Street and Second Avenue for two miles.

Lanes will be 12 ft. wide, and shoulders 8 ft. wide in cuts and 10 ft. wide on fills. Reinforced concrete pavement 10 in. thick with 6-in. granular base has been adopted, with raised median strip 4 ft. wide and reflectorized batter curbs. Design speed is 60 mph. Streamlined roadway construction is planned to carry shoulders full width across all bridges. Shoulders are to be stabilized with selected excavation, in event disabled vehicles must use them.

All interchanges will provide for direct movement, without left turn at any point. Six interchange locations in all have been established.

Downtown Interchange

Before going on to the construction work, let us look further at the interchange design, now worked out for the downtown terminus of Penn-Lincoln Parkway East. This element will be far-and-away the most important one in the success of the entire Parkway development. Average 24-hour traffic volume using the interchange will be about 80,000 vehicles.

From the plan sketch, note that this terminus observes the location principle now widely adopted for urban radial expressways; namely, of skirting the congestion center and discharging or receiving local traffic at numerous points, so as to create the least turmoil.

The interchange system includes connections to Ferry Street about one half-mile west of Grant Street and other distributing connections about 1½ miles east of Grant Street, thus spreading the system more than 11,000 ft. along the expressway axis.

The system will merge into existing Water Street, a divided circumferential by-pass highway along the riverfront, and will provide street connections at several points in the area of Smithfield bridge. This group will lead in and out of Grant Street, the most important N-S street downtown. Another part of the development will occupy locations north of the B & O railway yards and on the Liberty Bridge axis. This branch will lead into a proposed new cross-town boulevard.

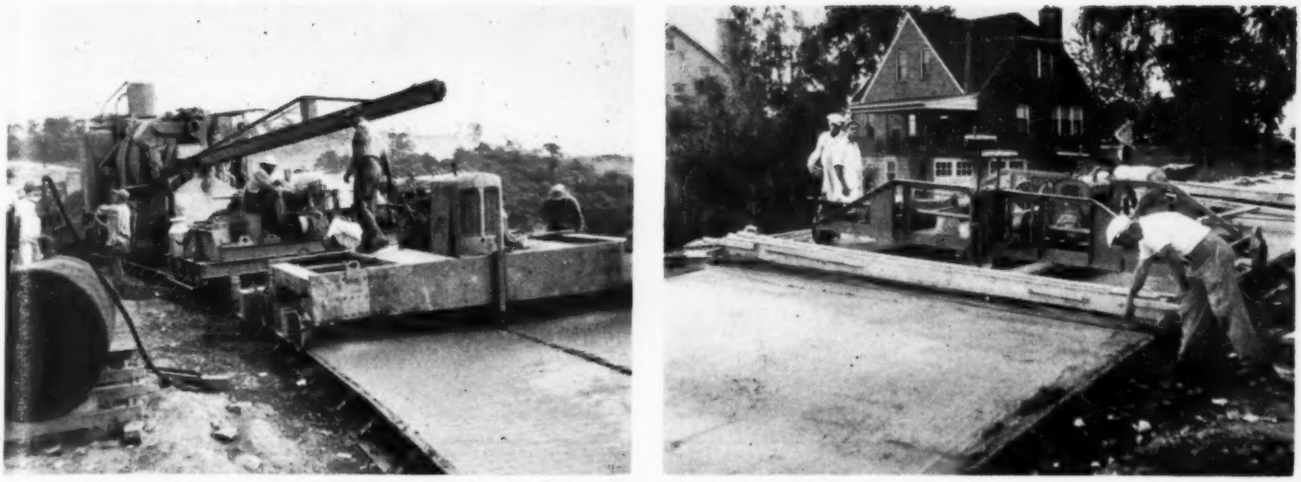
The downtown interchange system has been under study for several years, by private consultants as well as public agencies. Innumerable interchange schemes were studied and discarded, and three basic schemes analyzed in great detail before adopting the present design which is considered as nearly ideal as any scheme possible. This system has been characterized by PRA engineers as the most complex ever devised. Construction will probably begin in 1950.

Six major contracts were in progress along the Parkway East during 1948. Working from the eastern fringe city-ward (see map), these will be described briefly.

Most easterly project was that of Johnson, Drake & Piper (763-6) consisting of $2,000,000 worth of work in the vicinity of the Ardmore Blvd. interchange. About 1.75 miles of express roadway, ramps, and four structures were included. Project let in 1946, completed summer 1948. The 68,300 sq. yd. of concreting was placed with a modern outfit consisting of a Koehring 34-E dual-drum paver, Blaw-Knox spreader and Jaeger finisher. The subgrade consisting of 4 in. depth rolled slag and 2-in. of cinders was first placed, using a 5-ton roller and R-B finegrader. A Cleveland formgrader worked ahead of Blaw-Knox road forms. Doweled joints are spaced 81½ ft., with every second joint an expansion joint. Siselkraft curing cover was used. Shoulders along this outlying section were built up with specification shale material, thoroughly rolled. Art Uren was superintendent; R. A. Robinson, resident engineer.

7-Structure Interchange

Next comes the group of bridges and ramps connecting the Penn-Lincoln Parkway with Ardmore Boulevard (U.S. 30 Lincoln Highway). Seven overpasses are included in the system (763-5A—see map) which was bid at approximately $1,000,000 in Sept. 1947, by Dinardo, Inc. Three structures are two-hinged steel arches of approx. 160-ft. span. One with four ribs carries the 4-lane deck of the Parkway over U.S. 30, two others, with two ribs, each carry 2-lane interchange roadways. American Bridge



★ First pavement to be completed was placed by Johnson, Drake and Piper at eastern fringe of city

Company fabricated and set steel arches, using cranes working on the ground and employing a falsework bent for the first arch segment placed in position. The remaining structures in the system consist of conventional concrete rigid-frame spans.

The bridges here and elsewhere along the Parkway will have heavily constructed hand rails and notably modern architectural detailing. Photos of some of the details including jointing accompany this article.

High Arch Bridge

Also in the 1948 scene was the job by Sanctis Construction Co., (02103-1) which completed a $302,000 bridge project consisting of a single 164-ft. open-spandrel concrete arch span rising 64 ft. over the expressway at Brinton Road. Abutments are U-shaped, earth filled. Roadway is two lanes. This structure was built almost entirely with the help of a Northwest crane with 100-ft. boom and 15-ft. jib, working from the ground below. Timber centering was supported on timber and pile falsework. The two ribs were poured simultaneously, in alternate rib sections, to balance deflection during construction.

Designed during the war, this was the first large open-type concrete arch to be undertaken by the Penna Department of highways in Allegheny county and its progress was watched with considerable interest. Ready mixed crushed-gravel concrete was used under a rigid specification. The bid included 2410 cu. yd. of Class A concrete @ $80. Perth & Reed were engineers for the falsework. Paul Batory was superintendent and Howard Amman engineer for Sanctis. Robert Robertson was resident engineer.

Next project westward (763-5B) largely completed during 1948 is an underpass carrying the expressway under railway and trolley tracks and two streets (Edgewood and Laurel). The contractor is John F. Casey Co., Pittsburgh. The contract, awarded Aug. '47, called for deck construction in stages, planned to permit uninterrupted high-speed rail traffic on four main-line Pennsylvania RR tracks. The design provides for 5 main-line tracks and space for a sixth, with a street roadway on either side, one street deck carrying trolley tracks and the other built integrally with an industrial tail track.

Street traffic was diverted during construction, and trolley service was confined to one track. Work then commenced on what amounted to 11 parallel deck segments, each independently constructed (see Section D. of sketch).

Pile-supported concrete foundations were required for all spans, with piles approx. 40 ft. in length driven to refusal in shale. For railways spans 14-in., 89-lb. steel piles were used for an 82-ton design load. Roadway span piles were 12-in., 53-lb., with 62 tons each.

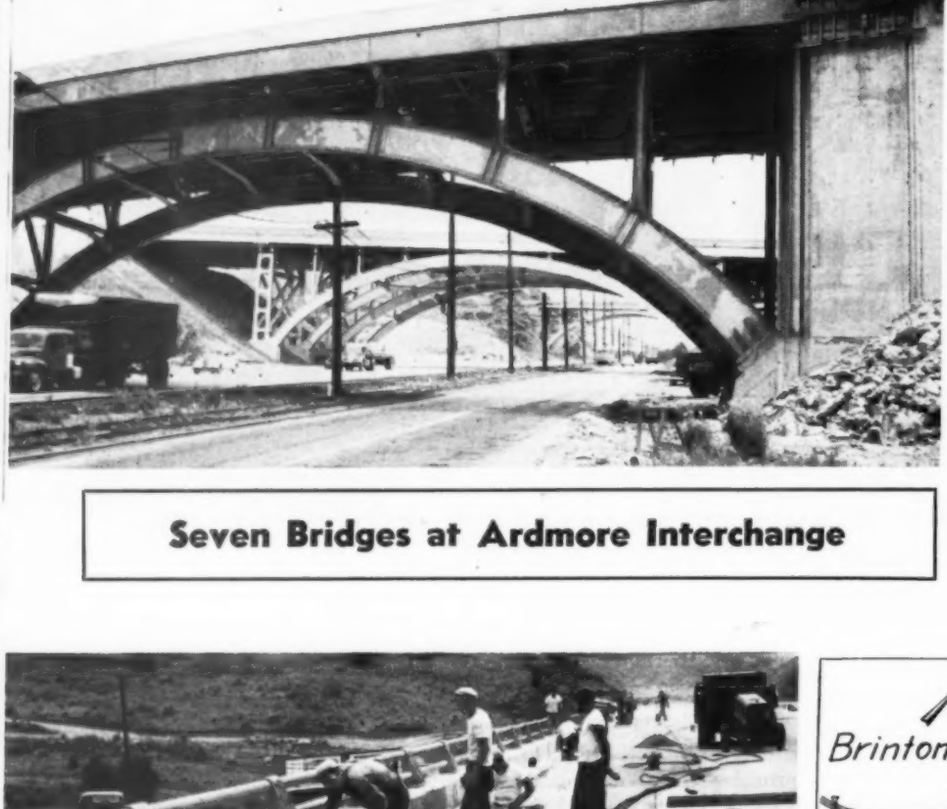
Rail spans consisted of structural steel rigid frames on concrete footings, supported cast-in-place ballasted deck slabs. Street decks consisted of conventional rigid frame concrete spans.

Much thought was given to the construction procedure. First considered was a 5-stage plan for supporting two tracks at a time on existing ground by means of sheet pile curtains. Curtains would be held together with steel rods located immediately beneath the tracks. By shortening the tail track and carrying it temporarily on a trestle it was possible to reduce the stages to four and save two months' time.

The plan used called for a first-stage scheme of tying four tracks together between pile curtains (see sec. A) of steel MZ-32 Z-piling. Tie rods of 1¾ in. diam. were used at 10 ft. ctrs. in conjunction with heavy H-beam wales (see photo). During this stage construction was completed for Laurel Street, the tail track, the future track location, and main-line Track 1. All work was of necessity performed by crawler cranes, rather than rail-mounted equipment, because of high-speed rail operation.

For stage 2, traffic was shifted from two of the four original rail lines to new Track 1 deck and a temporary span on the "future track" site (see sec. B). Two additional main-line rail spans, the tail track span, and the Laurel Street deck were then constructed. This step involved driving another Z-pile wall and tying it to confine the remaining two undisturbed

★ Schematic drawing of the 2-mile-long Downtown Interchange, which will carry 170,000 vehicles daily with numerous dispersion points

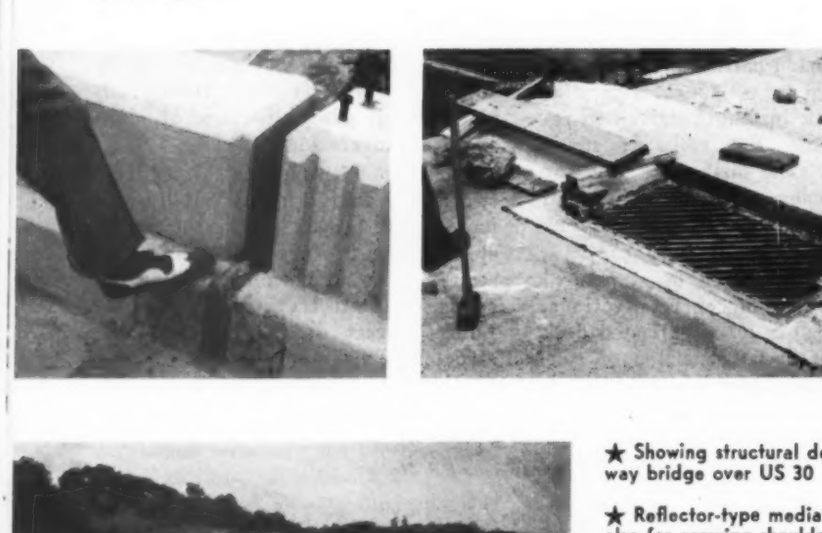


★ Three steel arch overpasses over US 30 at the Ardmore Boulevard Interchange. Middle structure with four arch rings carries the Parkway. Dinardo, Inc., contractors

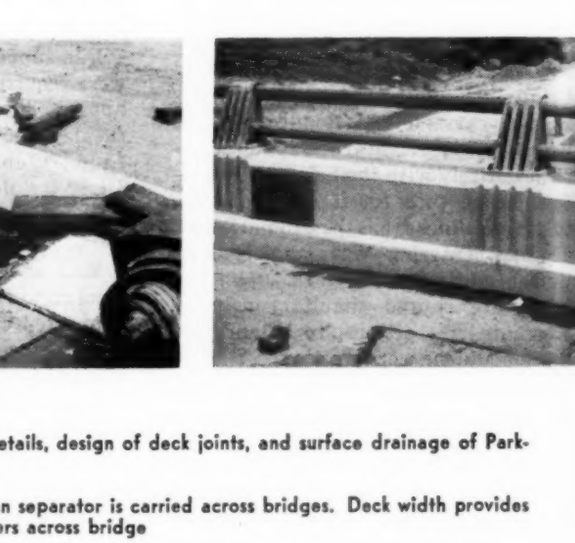
Seven Bridges at Ardmore Interchange

rail tracks. This step involved hazardous and difficult work by the contractors, who had only 26-ft. width of space in which to drive the new curtain wall, excavate, set falsework and place steel. All work, including delivery of reinforcing steel, structural steel and concrete placement, was performed beneath the new temporary and No. 1 track spans.

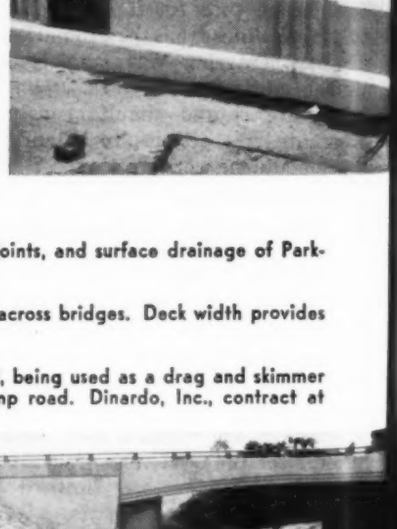
At the start of stage 3 half the Edgewood Avenue deck was built, after which work shut down for the winter. Spring 1949 work will begin by pulling curtain piles and shifting rail lines 3 and 4 to new spans, after which the two remaining rail spans



★ Hand rail design for Parkway structures is notable for strength and good appearance



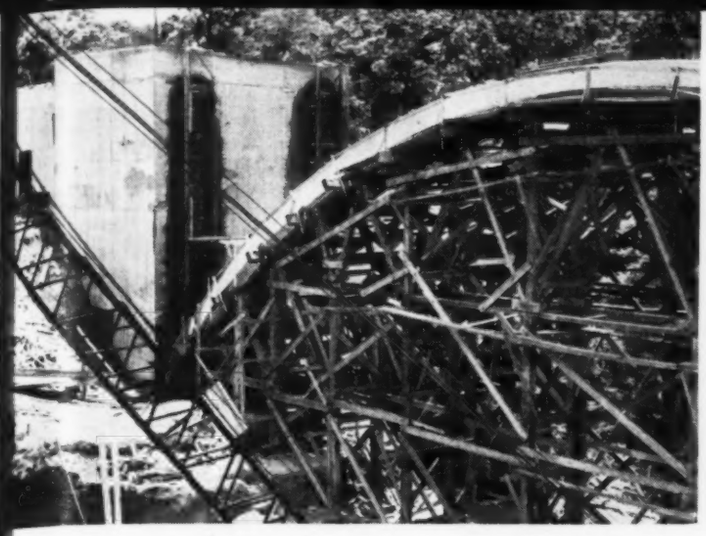
★ Plan of Ardmore Boulevard Interchange between US 30 and Parkway



★ Showing structural details, design of deck joints, and surface drainage of Parkway bridge over US 30

★ Reflector-type median separator is carried across bridges. Deck width provides also for carrying shoulders across bridge

★ Allis-Chalmers tractor with front-end shovel, being used as a drag and skimmer to spread and finish stone shoulders on a ramp road. Dinardo, Inc., contract at Ardmore Interchange



Sanctis Firm Built This Arch

★ The Parkway will pass under Brinton Road—a single 164-ft. concrete arch. Sanctis Construction Co., contractor. The crane is a Northwest with 100-ft. boom and 15-ft. jib

will be constructed. Then as the final or 4th stage, Edgewood Avenue deck will be completed, the five main-line tracks moved to their final location, and the trestle taken up from the "future track" location.

Some 27,000 cu. yd. of ready-mixed concrete will be required for the completed project, for which the contractor has posted $1,000,000 bond to the Pennsylvania RR against possible damage or accident during progress of the work.

E. M. Hawkins is superintendent and Frank Scrano engineer for John F. Casey, of which S. L. Fuller is president. E. A. Rush is resident engineer.

More Concrete Arches

Immediately east from the new Squirrel Hill Tunnel (to be described), traffic on Penn-Lincoln Parkway will cross Commercial Avenue and traverse a valley, Nine Mile Run, at high level over a 980-ft. open-spandrel concrete arch bridge. Dinardo, Inc., of Pittsburgh, were awarded this project (763-4A) at $1,778,000 in Jan. '48. This is one of the largest concrete arch structures built in the U. S. in recent years. Main spans, three in number, are each 170 ft. between springing lines. Four lines of arches will support the 4-lane divided roadway and 8-ft. water table or shoulders (sidewalks).

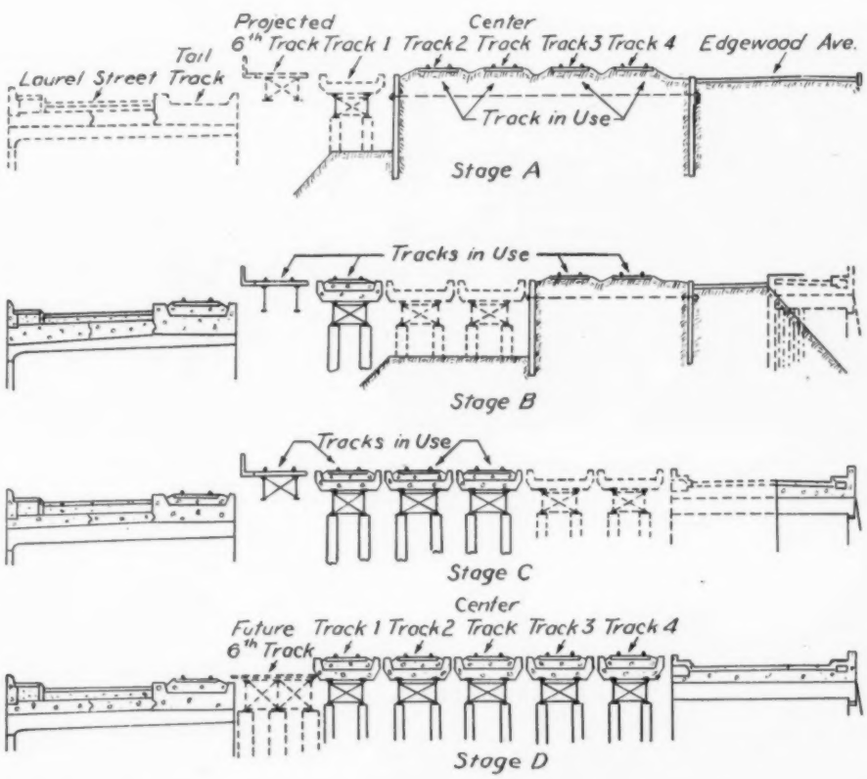
Construction has proceeded with remarkable ease under the crew of this experienced bridge building firm, which employed special Blaw-Knox steel centering, built in 30-ton sections and moved laterally on wheels to each of the four positions. A crawler crane with 110-ft. boom and jib has been used to set centering and wood forms, place concrete, etc. Centering is so designed that the sections could be rolled to new positions in a few hours. Ready-mixed slag concrete has been used throughout.

Charles Dinardo and Chas. O. O'Toole are in charge for the contractor; G. E. Riley is resident engineer.

Good Headway on Tunnel

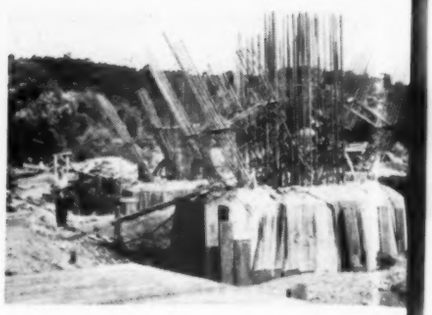
Known as Project 763-4 (1), Squirrel Hill Tunnel located 4½ miles east of the Triangle was awarded in 1948 to B. Perini & Sons, Inc. of Boston. The $13,767,000 contract price makes this the largest federal-aid highway project in history. A previous article [Sept. '48 R&S] described the design briefly. This twinbore tunnel will be 4,225 ft. long, each bore affording a 24-ft. roadway and service walkway. Of the total length, 3,885 ft. will be driven through rock with a "cut-and-cover" section at each end to make up the remaining distance. The roadway will be on a tangent with a uniform 2.5% grade throughout, rising to the west.

The rock formation through which



★ Showing the four sequences devised by John F. Casey, Inc., for expediting construction of the Pennsylvania RR overpass over the Parkway at Laurel Street (Construction photos next page)

(See also photos on next page.)



Dinardo's Spectacular Arch Job

★ (Above) One line of rings completed for the three 170-ft. arch spans on the Parkway's Commercial Ave. bridge (Nine-Mile Run). Blaw-Knox steel centering was used, being moved laterally to construct the other three rings. Dinardo, Inc., contractor Crane: Manitowoc

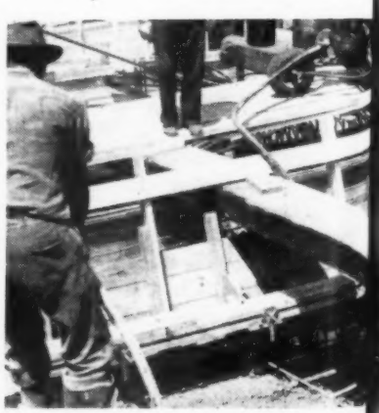
★ (Also above) Details of reinforcing used in arch footings; note gin pole and pulley blocks used to hoist heavy bundles of 1¼-in. reinforcing steel to position at this stage

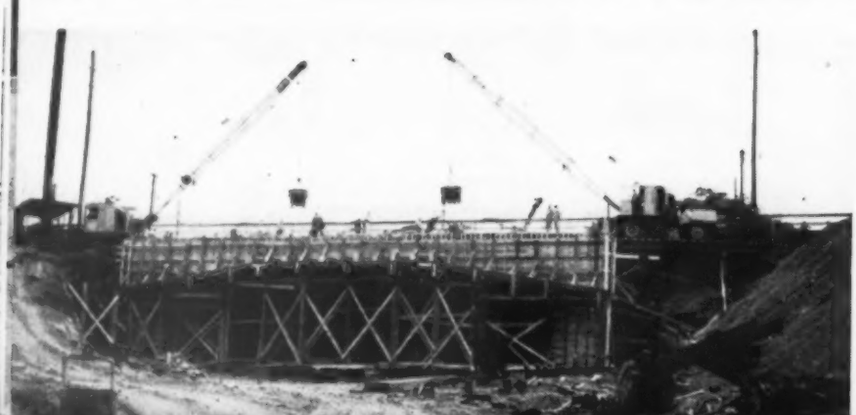
★ Ready-mix for the arch job being delivered here by a Jaeger mixer on an Autocar. A Lima crane with 60-ft. boom used with Blaw-Knox drop bucket for footing pours

John F. Casey's 4-Stage Underpass

★ (Below) At left: forms in place for a concrete rigid-frame span, John F. Casey project. Center view: steel sheeting in place for the first curtain wall, to support rail tracks during adjacent construction work. Right: vibrator equipment being used on rigid-frame concrete span

★ (Bottom of page) A Lorain truck crane and a Marion crawler-mounted crane are placing concrete simultaneously from ready-mix trucks. At right: note improvised chute for direct delivery of ready-mix for a footing





the tunnel passes is mostly shale with some sandstone, limestone and shaley limestone. This formation causes a bad roof condition which makes necessary the setting of steel ribs on 2-ft., 4-ft. and 5-ft. centers for support on both the sides and the top. Where necessary, steel lagging is placed between the ribs to prevent rock falls.

Rate of Progress

Work was started at the east end with excavation of the cut-and-cover section at the eastern portal. Drilling and blasting have been used from there on. Devevopment of a definite cycle of operations has resulted in an average daily advance of 20 ft. in each tunnel. The average length of the cycle is 8½ hours, as follows:

Drilling	90 min.
Loading Holes	40 min.
Moving Jumbo Back	15 min.
Shooting	10 min.
Ventilating	40 min.
Bulldozing Fly Rock	20 min.
Mucking Out	200 min.
Moving Jumbo to Face	15 min.
Setting Ribs	90 min.

(These times are, of course, average)

Blast holes are drilled from three-deck, steel-frame jumbo one for each bore, mounted on rails and towed to and from the face by a bulldozer. The inside sections of both the bottom and the second wooden platforms of the jumbo drop down to permit the mucking shovel and trucks to pass through. These sections are then raised to drilling position by an Ingersoll-Rand utility hoist mounted on the top deck. Sixteen 3½-in. Joy drifters are used on one jumbo, four mounted on each deck. On the two lower decks, the drifters are also column-mounted while the two in the center are mounted on Joy Hydro-Drill-Jibs. These hydraulically operated jibs allow quick, easy positioning of the drills and simplify collaring the high, hard-to-reach center holes.

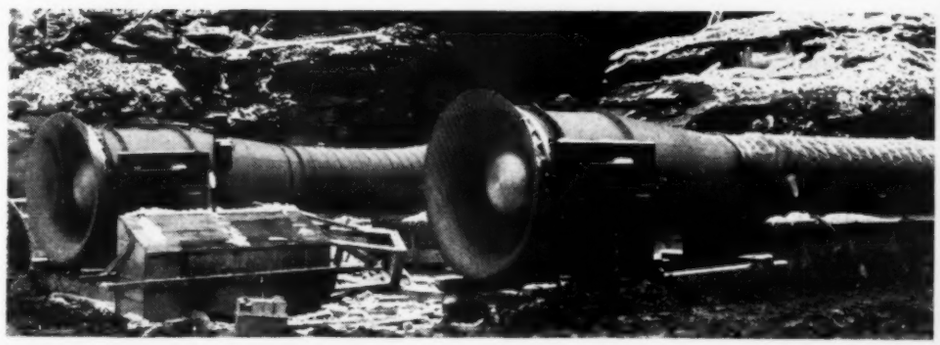
Drilling Methods Used

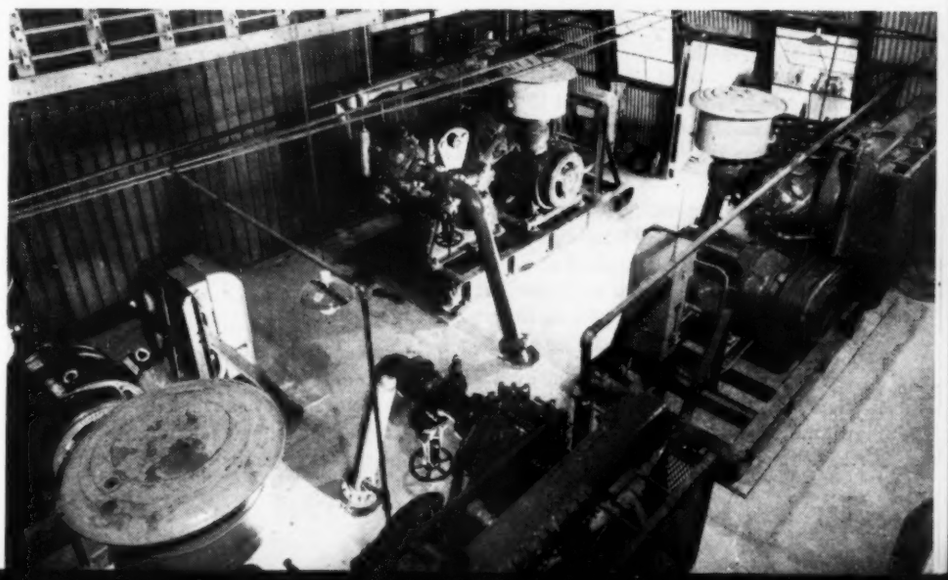
The drill pattern is a 114-hole V-cut with holes allocated so that no drill is required for more than nine holes per round. Twenty men drill the round, load and shoot the holes. Of these, 12 are drillers and 8 are chuck tenders.

Steel for drilling is Crucible 1¼-in. round lugged hollow steel processed

★ East portals of Squirrel Hill tunnel. Note position of ventilators. Perini's operating base, including buildings for compressors, shower-locker facilities, first aid station, shop, and field office, is located at immediate left of portal and on same level as tunnel floor

Glimpses of Perini's Tunnel Work

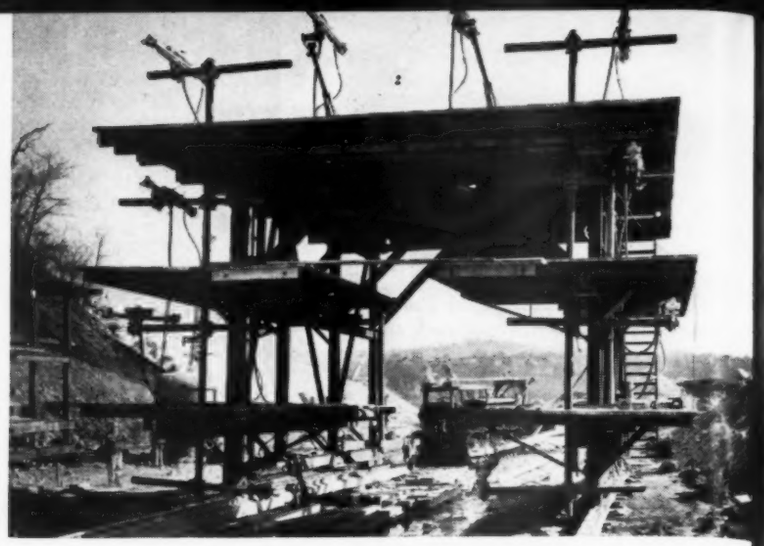




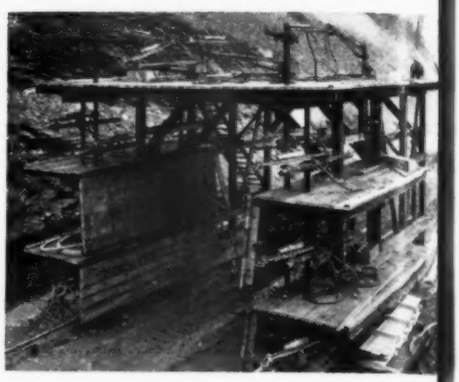
★ A Lorain shovel (modified) is used in one bore, as shown, and a Northwest shovel in the other. Fleet of Euclids carry out to the dump

★ Temporary ventilating installation as set up for first 500 ft. of tunnel. Joy fans deliver 43,000 cfm. of fresh air to each face via 36-in. sectional spiral welded tube

★ Inside the compressor house, where four 750 cfm. Joy compressors are stationed to supply drilling at 125 psi. pressure



★ At left: the 16-drill jumbo in operating position. Above: detailed view of same jumbo. Joy 3½-in. T-390 drifters are column-mounted at lower drill stations and at outside stations on top deck. See Article



★ The 14-drill jumbo for the other tunnel, shown with deck sections lowered to allow passage of equipment

★ Quonset huts which house the contractor's office, air equipment, tools, etc.

by Iron City Spring Co., Pittsburgh. Bits are Timken, Type "H," side-hole, detachable, stepped down in ⅛-in. steps from 2 in. to 1¾-in. The two-inch starter bit is used for all holes on a four-foot steel, followed by the 2¼-in., 2⅛ in., 2 in., 1⅞ in. on an eight-foot steel. The second steel-change for the V-cut holes is a ten foot length. Of late 2¼ and 2⅛ in starter bits have also been used.

To supply air for the drill requirements and other supplementary air tools, four heavy-duty Joy WN-102 semi-portable air compressors are housed in a quonset hut just outside the east portal of the tunnel. These compressors, with air-cooled intercoolers and water-cooled cylinder jackets, are two stage, double acting, two cylinder, V-belt driven units of the continuous, heavy-duty type.

The face is blasted by the electric-cap method using delays of one-second intervals in numbers 0 to 13 inclusive. Hercules detonators and gelatin powder (usually 30%) are being used.

Each heading is ventilated by a Joy Series 1000, axial-flow fan of 54 in. diameter, powdered by a 75 hp. motor. Fresh air is carried as close to the face as is possible by 36-in. diameter Spiratube. This duct is made up in 25-ft. lengths, which are added as needed to bring the outlet close enough to the face to supply fresh air to the face only, clearing the tunnel after each blast in from 30 to 40 min. As the working face gets farther from the portal, break-throughs, between the tubes are driven every 500 ft. as passageways in the completed tunnel. By using these break-throughs, fresh air may be blown into either tunnel and out the other.

Huge Ventilator Fans

With this arrangement, three fans will force 250,000 cu. ft. per min. of fresh air to the face. As each new break-through is driven, the next one back toward the portal is blocked off with a wall to force the air to the break-through nearest the face and up to the face itself.

Mucking out the south tunnel, which was the first one started, is done with a 1½ yd. Lorain diesel shovel converted to electric drive. The north tunnel is being mucked out with a 1½-yd. Northwest shovel converted to electric. Both shovels have special short-boom arrangements for working in the restricted area. They load directly into 15-ton Euclid rear-dump diesel trucks which haul the rock to the approaches for use as fill. Time required for mucking out the approximately 600 tons pulled each round (both bores) is from 2½ to 3½ hours.

Steel supporting ribs are set by the drilling crews. They work on the jumbo which is towed back to the face immediately after the mucking has been completed. Side beams are hoisted into place by the utility hoist mounted on the top deck. Roof beams, in two pieces joined at the center, are lifted into place by the men and held on wooden blocks while being bolted into place. Lagging is then placed where necessary.

What of Future?

During 1949 at least one more Parkway contract may be let. But further progress will hinge on new financing.

Plans are well advanced for carrying the Parkway onto the Triangle's "Point" across the river, and westward via tunnel under Duquesne Heights. The Parkway from the Downtown Interchange to the Point will involve very costly construction, includ-

(*Continued on page* 84)

Cost Keeping vs. Time Keeping

Timekeepers are not underpaid considering the perfunctory work they are usually expected to do, notes this practical writer, who suggests that more contractors keep time-cost sheets day by day

By E. T. Nettleton
Associate Highway Engineer
State Highway Department of Connecticut, Hartford

ON a construction project the prosecution of the work and the keeping of intelligent costs are two factors which should keep in step. Unfortunately, too many contractors pay too little attention to the second step. In a previous article* the chief advantages of keeping construction costs were pointed out to be:

(1) Render data from which one can determine whether the work is being done at a gain or at a loss at a given time, before it is too late to modify procedure or to rectify unsatisfactory conditions.

(2) Offer a bona fide record regarding claims for extra expense caused by changes in plans, additional work, or other contingencies.

(3) give valuable aid to safe and intelligent bidding on future work.

The reason why contractors employ the type of timekeepers which they do stands out as the sixty-four dollar question in the minds of many engineers. The weekly salary or wages of these timekeepers may be low. However, any business man would agree that they are not as a rule underpaid for what they do. What do they do? They keep the time sheets! Yes, each employee gets credited for the time he is on the job. Where he is working, what item his time should be charged against, and the amount of work he accomplished, either alone or jointly with others, is not recorded. As a rule, foremen keep no reports, and superintendents are too busy with the over-all aspects of the project to notice. Supervisory executives in the main office have to place their impressions and draw their conclusions from inadequate information since no one is responsible for costs.

Slip-Shod Procedure

With such a slip-shod procedure there is no doubt that estimators do not know what their own forces can do. Consequently they have to assume theoretical figures from handbooks regarding the number of square feet of forms per day per man, or the number of brick per day per man, the linear feet of rock drilled per day per man, the pounds of reinforcing handled per day per man, and one thousand other items which might be listed. When inadequate methods are replaced by adequate daily records, superintendents become aware of inefficient and uneconomical operations.

Contractors should revise their policy of placing on the job as timekeepers such persons as pampered relatives, recent theoretically trained graduates, or former manual workers who are physically incapacitated. At least, if they insist on continuing such a policy, they should first properly train the personnel. Better yet, let's pay a few dollars more and substitute for the timekeeper a *time-cost keeper*. Such a person could allocate the individual's time to the item or items he is working on. The argument is given that the men are shifted from one operation to another so many times during the day that the cost keeper could not possibly keep track of the men for the proper allocation of their time. In many cases this statement is correct. Nevertheless, it has been proven that butterfly movements do not produce job efficiency or lower project costs. In addition, the daily measurements of work accomplished and the daily notation of unusual conditions does not involve an exhorbitant amount of a person's time, nor does it require a highly trained, technical-minded individual. Furthermore, such a person equipped with a stop watch will find time to make a few worth while observations regarding inefficient operations. Another argument is given that the timekeeper is too busy to do all this. When a financial incentive is offered and the timekeeper is instructed that cost records must be kept by him, the time for such extra duties is usually found. Naturally, the cost keeper must be taught how to keep the time-cost record.

Knowledge of the details of costs is absolutely necessary to the superintendent to prosecute work. The speed at which work should move lies somewhere between mad haste and slovenly delay. It is only in a special emergency that the progress of work should not follow the less expensive way consistent with satisfactory results.

Will Aid Superintendent

Contractors should adopt a *simplified* time-cost record. There are certain basic fundamentals which this form must include. It must be workable. In other words, it must be as simple as possible and yet give the desired results. No system is stronger than its weakest link. In this case, the weakest link is the timekeeper or cost keeper in the field. Remember a construction man is not an accountant. Final computation of costs will be no more reliable than is permitted by the care consumed in making the field allocations of time to items. In the next place, the system must be flexible so that it can be expanded, altered, and adapted throughout all company operations. The information on the form shall be coordinated with the bookkeeping system. If the form is properly designed, part of the information on the form could be directly used in making out payrolls. This would save considerable duplication of effort. Furthermore, it would prevent the embarrassment of disagreement in the results obtained from the bookkeeper or the cost keeper.

Must be Kept Up

The form must be completed each day. Hours, as well as dollars, must be recorded against the individual items. By recording hours the estimator can better calculate work in the future. Even though wages have changed considerably, the production quota per given machine or man will not vary to a large extent. By recording dollars the treasurer of the company knows whether a profit or a loss is being entailed. By completing the form daily, the job superintendent can better analyze all of his individual operations. Thus, he can bring about corrective measures immediately.

Any simplified cost record suggested would naturally fail to meet the requirements of all contractors. However, a typical sample is given for a

*Nerba, July 5, 1947, "The Necessity for Adequate Cost Records."

Daily Report

JOHN DOE CONSTRUCTION COMPANY

Payroll and Cost Sheet

Office — Supt. C. Smith — Job F.A.P. - 161-C Cheshire - W

Gen. Supt. P. Stevenson — T-K B. Brown — Date 11/16/48

Operations

Tuesday - Nov. 16, 1948

Weather - Fair

Remarks

Excavation - Station 24+50 to 26+75
Subgrade - Station 12+00 to 16+00
Gravel Subbase - Station 7+75 to 11+00
Stone Base Course - Station 0+00 to 7+50 (left side only)
Class "A" Concrete - Bridge Abutment - Station 41+20

3/4 C.Y. Shovel with Backhoe - down for repairs
Sub-contractor on Clearing and Grubbing did not show up. Olaf Swanson foreman says they are having labor trouble. He expects that agreement will be reached Thursday evening and forces will report to work Friday

Name	Hr.	Rate	Total Pay	Overhead Hr.	Overhead Total	Excavation Hr.	Excavation Total	Subgrade Hr.	Subgrade Total	Gravel S.B. Hr.	Gravel S.B. Total	Stone Base Hr.	Stone Base Total	Class "A" Conc. Hr.	Class "A" Conc. Total
A. Smith - Supt.	9	Day	15 00		15 00										
B. Brown - T.K.	9	Day	10 00		10 00										
D. Lewis - Watchman	-	Night	5 00		5 00										
K. Black - Waterboy	6	.50	3 00		3 00										
A. Webster - Foreman	8	1.50	12 00			8	12 00								
N. Shapiro - Shov. Oper.	8	1.82½	14 60			8	14 60								
K. Viets - Laborer	8	1.25	10 00					4	5 00			4	5 00		
T. Sinsigalli - "	8	1.25	10 00			2	2 50	2	2 50					4	5 00
T. Jones - Truck Driv.	8	1.00	8 00			4	4 00			4	4 00				
Sub Total			243 95		45 25		79 10		26 00		35 10		32 00		26 00
20% S.S. Taxes, Insurance			48 69		9 05		15 82		5 20		7 02		6 40		5 20
Sub Total - Labor			292 64		54 30		94 92		31 20		42 12		38 40		31 20
Pick Up Truck	10	1.50	15 00		15 00										
1½ C.Y. - Shovel	8	10.00	80 00			8	80 00								
1 C.Y. - Shovel	8	7.50	60 00							8	60 00				
75 H.P. - Bulldozer	8	5.00	40 00			8	40 00								
Road Grader	8	4.00	32 00					5	20 00	3	12 00				
Roller	8	4.00	32 00					2	8 00	2	8 00	4	16 00		
Truck - No 3	7	2.50	20 00			7	20 00								
Sub Total - Owned Equip.			319 00		15 00		180 00		28 00		80 00		16 00		
Truck - No 4	8	4.50	36 00							8	36 00				
Truck - No 5	8	4.50	36 00							8	36 00				
Truck - No 6	8	4.50	36 00							8	36 00				
Sub Total - Rental Equip.			108 00								108 00				
Gasoline - Pick Up - gals	5	.12	60		60										
Gasoline - 1½ C.Y. Shovel - gals	80	.12	9 60				9 60								
Diesel Oil - Bulldozer - gals	25	.08	4 00				4 00								
Ready Mixed Concrete - c.y.	2½	10 50	26 25												26 25
Sub Total			514 95		60		28 00		1 50		8 10		450 00		24 00
Sub Total			292 64		54 30		94 92		31 20		42 12		38 40		31 20
Sub Total			319 00		15 00		180 00		28 00		80 00		16 00		
Sub Total			108 00								108 00				
Total			1233 59		69 90		302 92		60 70		238 22		504 90		57 20

Cost Summary

← Filled in by Gen. Supt. →

Item No.	Item	Quantity Completed this day	Total Cost	Unit Cost	Other Cost	Overhead Cost	Total Cost	Bid Price	+ or −
	Overhead - Job	—	69 90						
	Excavation	410 C.Y.	302 92	.74		.04	.78	.75	- .03
	Subgrade	800 S.Y.	60 70	.076		.004	.08	.10	+ .02
	Gravel Subbase	220 C.Y.	238 22	1.08		.06	1.14	1.25	+ .11
	Stone Base Course	150 Tons	504 90	3.35		.18	3.53	3.75	+ .22
	Class "A" Concrete	2.5 C.Y.	57 45	22.90		1.28	40.00	40.00	Structure
	$\frac{\$69.90}{\$1233.59} = .056$								

Notes

* This price exclusive of foreman work done previous day

** This column does not include allowance for main office overhead.

small road builder. This can serve as an aid. Each contractor may for his own use devise a similar form which will meet his particular needs. Knowledge at the time when it is most needed is of great value.

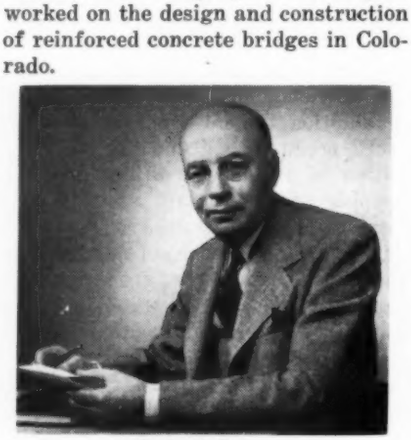
(Any opinions expressed in this article are those of the author, and do not necessarily reflect the views of the State Highway Department of Connecticut or of this publication. This article may not be reprinted without the permission of the author.—Ed.)

A. J. Boase of Cement Association Dies

Arthur J. Boase, 56, for the past 16 years Manager of the Structural and Railways Bureau of the Portland Cement Association, died of a heart attack in his office on February 9, 1949.

Mr. Boase joined the Association in 1930 as regional structural engineer in the Philadelphia district. A civil engineering graduate of the University of Colorado, Mr. Boase later received his master's degree from the University of Pennsylvania and spent his entire professional life in structural design work.

After completing his college work, Mr. Boase designed dams and tunnels in the Rocky Mountain region for eight years, principally for the Boston Colorado Power Company. Then for three years, as manager of the Fair Engineering Company in Denver, he worked on the design and construction of reinforced concrete bridges in Colorado.



★ A. J. Boase

He served on the staff at the University of Pennsylvania and later at Pennsylvania Military College.

Mr. Boase was an internationally known authority in the field of reinforced concrete design. He traveled extensively for the Association in Europe in 1936, studying European practice in reinforced concrete design. In 1944, he was granted a leave of absence from the Association to visit South America and to write an extensive series of articles on the design and construction methods of South American engineers and architects in the field of reinforced concrete building.

At the time of his death Mr. Boase was chairman, Executive Committee Structural Division of the American Society of Civil Engineers, and was a Director of the American Concrete Institute.

Mr. Boase served as chairman of both the ACI Building Code Committee and the ASCE Committee on Masonry and Reinforced Concrete. He was also a member of the Reinforced Concrete Research Council and the Joint Committee on Standard Specifications for Cement and Reinforced Concrete and author-chairman of the ACI publication "Reinforced Concrete Design Handbook."

●

2,500,000 Increase in Car Registration—The number of privately-owned automobiles registered in 1948 is estimated at 33,225,000. This was approximately 2,500,000 more than the 1947 total. Truck and bus registrations increased from 6,641,611 in 1947 to approximately 7,332,000 in 1948.

★ Continuous belt loader—ideal for task shown here, which consists of cleaning up and filling trucks with material bladed out of ditches. This routine maintenance operation used to be done laboriously with hand shovels, at a cost of 25c per cu. yd., depression and mid-'30 prices. Today despite inflated costs front end loaders have cut intermittent loading operations to 11 or 12c per cu. yd. according to Rex M. Whitten, engineer of maintenance, Missouri. And costs with continuous belt type units along work sections of considerable length are as low as 3c per cu. yd.

Reducing Maintenance Costs

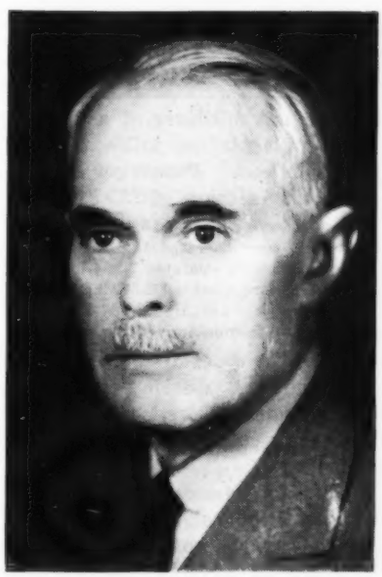
on County and Local Roads

Presented before the County Highway Officials Session, American Road Builders' Association Annual Meeting, February 8, 1949.

By J. S. Bright

Deputy Commissioner, Public Roads Administration, Washington, D. C.

THE importance of adequate maintenance on our secondary and local highways was brought forcibly to my attention several weeks ago when I was called before a committee of the U. S. Senate regarding Joint Resolution 38. That Resolution provided authority for Federal agencies to cooperate with State agencies in breaking through snow-bound areas in the western range States so that feed and other necessary care could be provided for the livestock. The common recommendation of the Federal agencies, the Red Cross and others at that meeting was to plow open as fast as possible the county and local roads.. The discussion emphasized the need for pooling the efforts, manpower, equipment and know-how so that joint action could be taken to accomplish the work with dispatch. The equipment supply, transportation and operating problems involved were specifically emphasized.



★ J. S. Bright

There was very little discussion about opening the primary highways. The State highway departments were plowing those roads, but the equipment was reaching the breaking point as a result of the operations, and some lacked the funds and authority to operate on the secondary and local roads.

The discussion that morning of the joint efforts of the various Governmental agencies to promptly execute the maintenance problem of removing snow made me think of the desirability of continuous joint efforts on the part of State and local agencies to economically maintain the large mileage of county and local rural roads. These roads are the feeders of our highway transportation systems for all the errands of daily living, including the spreading of products of farms, mines, forests and factories to all the places where those products are needed and wanted.

Scope of Problem

The cost of road maintenance is rising. In terms of the 1935 dollar, the 1948 dollar produced only 53 cents worth of maintenance. The increase in quantity, weight and speed of traffic has also increased the requirements for more extensive maintenance performance. The nation's total road maintenance bill for all state, county, local and municipal roads rose from 393 million dollars in 1921 to 992 million in 1947 and a preliminary estimated total of 1,103 million in 1948. The latter resulted in a ratio of 72 cents for road maintenance for every

★ Front-end or vertical loaders are gaining rapidly in position as a versatile type of unit for maintenance. They load, clean ditches, demolish stockpiles, fill trucks fast, scoot rapidly over the road

construction dollar expended. A breakdown of the expenditures by each governmental group is here made.

The maintenance expenditures on county and local roads rose from 201 million dollars in 1921 to a preliminary estimated total of 404 million in 1948, or $1.46 for every construction dollar expended. Maintenance operations thus bulk larger than construction on county and local roads.

Maintenance Expenditures in Millions of Dollars

	State	County & Local	City & Village	Total
1921	80	201	112	393
1947	372	375	245	992
1948	397	404	302	1,103
1948	1,131	276	124	1,531
Ratio 1948 maintenance to construction	.35:1.00	1.46:1.00	2.42:1.00	.72:1.00

Measured in mileage, the maintenance problem on county and local roads again bulks larger than on highways under the state highway jurisdiction. Of 2,937,000 miles of rural highways under state and local control, 550,000 miles—of which 83% is surfaced—are under state control. The remaining 2,387,000—of which 43%, or 1,035,000 miles, are surfaced—are under county and local control. While a segment of the county and local mileage is improved each year through construction operations, the remaining and much larger portion of the roads is only reached under maintenance operations. The condition and economy of operating on our county and local roads depend in a major way on how our local highway departments are organized for systematic road maintenance operations, and the means available for carrying out the work.

The responsibility for the maintenance of local roads is dispersed over various classes of highway organizations in some states, and the smaller organizations do not always have the means or the opportunity to realize some of the economies of mass production methods and mechanical aids.

Maintenance Becoming Mechanized

Road maintenance is gradually becoming an equipment operation. In a nation-wide study of maintenance activities on primary highways by the PRA, it was found that equipment was used in the course of a year per 1,000 representative miles of highways as follows: Passenger cars and pick-up trucks traveled 253,817 miles.

Trucks were operated 75,385 hours.
Graders were operated 18,669 hours.
Spreaders were operated 7,994 hours.
Mowers were operated 5,803 hours.
Tractors were operated 2,637 hours.
Loaders were operated 1,131 hours.

Many other types of equipment such as bituminous distributors, power shovels, compressors, road rollers, snow equipment, etc., are used extensively.

Much could be accomplished if plans could be developed for joint efforts between various governmental agencies to maintain roads radiating from equipment depots located with studied reference to each other on the basis of proven equipment capacity.

The sufficiency of maintenance of so large a mileage of secondary and local highways rests upon adequate equipment and a full-time organization of trained operators and an operational plan that does not depart too far from the concept of the continuous use of the most efficient maintenance equipment plant that can be assembled.

Motor Industry Parallel

It has often been said that highways and the motor industry are complementary and must be developed together. An illustration of what the motor industry has done through planned mechanization to lower the cost of production is, therefore, timely.

One automobile company has checked its records and found that in 1908 its employees worked 60 hours a week for $12 in wages (in terms of 1947 dollars, really $28.35).

That year, 1908, this company began buying machinery to replace some hand tools. The process continued steadily until by 1948 the company had about $6,000 invested in equipment for each employee (replacements in 1948, $10,000 per employee). And in 1948 the company's average employee earned $67 a week—more than double his "real" wage of 1908, in terms of purchasing power.

He worked 40 hours a week instead of 60 hours. He earned more because, with machinery, he could produce more. And his work was easier. Muscular effort accounted for only 5% of the total work done.

Road Maintenance Studies

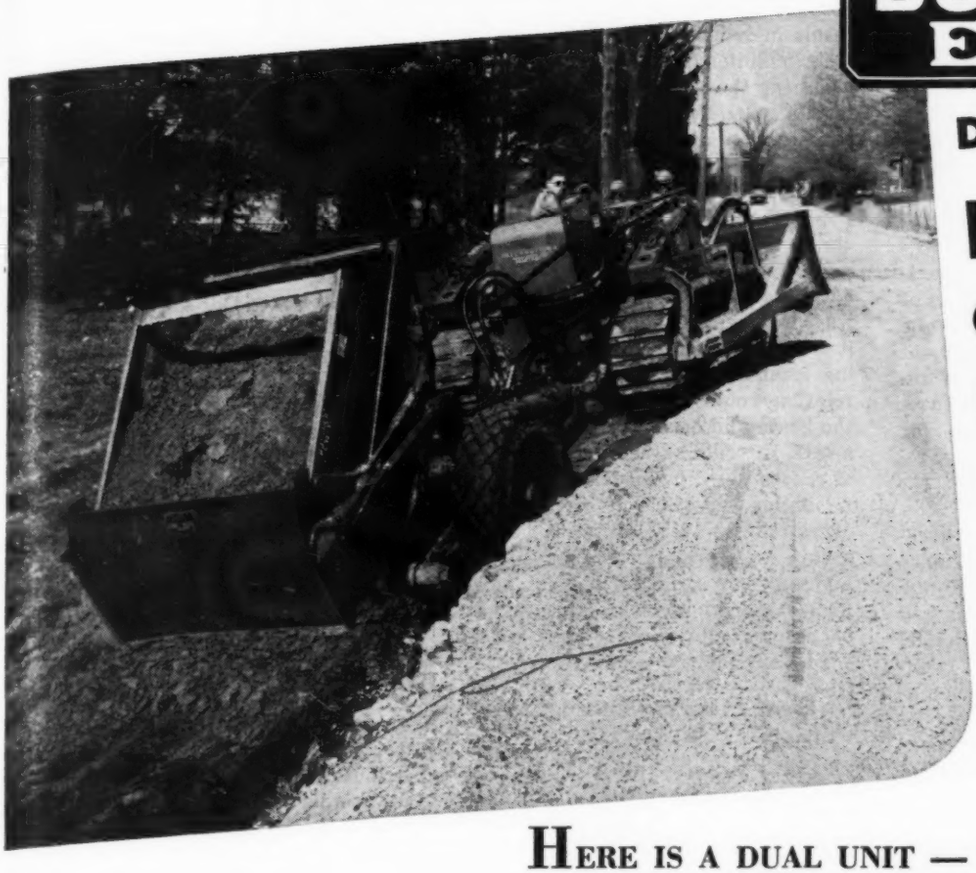
Highway departments have not sat by idle. They, too, are turning to modern mechanized production methods to reduce the cost of some maintenance operation. The Virginia Department of Highways reports cost studies on mechanical and hand methods of loading into a truck 3 cu. yd. of the spoil from ditch-cleaning operations [Jan. '49 R.&S.]. On one test section it cost 12c to load a truck by mechanical means as against 70c by hand methods; on another it was 43c by machine as against $1.23 by hand; and on still another it was 72 cents by machine as against $2.13 by hand. Direct on-job on trial sections varied between 37% and 91%.

The illustrated reduction in production costs in the automotive industry is the result of overall efforts of the corporations to meet competition. It required the retention of technicians and industrial managers to study the various processes or mechanical aids used by the corporations and to recommend less costly processes or more productive types of machinery. It required men with a background of knowledge of what is being done by other members of the industry and of new ma-

BUCYRUS ERIE

DUAL UNITS

keep county roads up, costs down



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Haul Dirt to a Fill
Level the Fill
Compact the Fill
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Make Ditches

Control is simple. Both dozer and scraper operate through a single hydraulic system. Operator can switch from one to the other instantly through two conveniently located levers. Visibility — front and rear — is excellent.

This outfit really clings to the slopes. Here's why. Mounting a Bucyrus-Erie Bullgrader or Bulldozer on the tractor causes practically no change in the original tractor balance point. Wide spread wheels and low center of gravity give the scraper exceptional resistance to tipping.

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4⅜ cu. yds. (heaped)
Requires 35 to 55 hp. tractor

G-58
5 cu. yds. (struck)
6¼ cu. yds. (heaped)
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★ Loads in front, dumps in rear
★ Simple hydraulic control
★ Double curve cutting edge
★ Balanced design, non-slap hitch
★ Ample flotation — low rolling resistance, exceptional stability
★ Steep dumping angle

BULLGRADER

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chine tools, new welding methods, heat-treating of steel, alloys and other technological advancements, as well as a knowledge of the durability of the resulting product in actual service.

State Secondary Division

The smaller counties, towns, townships or road districts, through which county and local road maintenance is now performed, could not parallel the examples of the automobile industry or of the larger State highway departments. They do not have the means of obtaining technical aid and may not be able to afford to purchase equipment for specific maintenance processes unless the equipment has multiple uses or arrangements can be made for sharing with other highway departments.

A committee of the Highway Research Board recently sent a questionnaire on highway maintenance matters to 2,530 counties. It had estimated that about 900 counties had engineers who could furnish technical aid on road maintenance. 520 counties replied. In 78 counties, maintenance work was supervised by maintenance engineers; in 195 counties, by county engineers. Thus, 273 of the counties replying had some form of engineering supervision. It would seem that the smaller units, such as townships and highway districts, would have still less engineering aid.

The cooperative divisions of State highway departments could give valuable aid in building up the technical phase of highway maintenance operations. The State highway department, as a common partner of all the local highway departments, could not only funnel through to each local highway organization the experiences of the State highway maintenance department and other counties in the State, but also, from thePRA, the road maintenance and equipment experiences of the remaining 47 states.

The cooperative division of the State highway department is here referred to as the common partner of the local highway organizations. If low-cost maintenance of the extensive mileage of secondary roads is to be obtained, there must be a strengthening of the county road maintenance departments. The cooperative division of the State highway department is considered as a designated outlet for cooperation with local highway units and not as a secondary road State highway department under a separate chief engineer.

Joint Maintenance Problems

Under the partnership concept, where each local highway department would have as a common partner the cooperative division of the State highway department, there arises many possibilities of mutual aid which would result in reduced cost and more complete maintenance performance.

During the recent war when the materials control plan was under the administration of the War Production Board, the Public Roads Administration appeared at hearings on allocations of scarce materials, equipment and manpower to present the needs of highway departments and to obtain adequate essentiality ratings for highway maintenance operations. Often it was difficult to obtain facts regarding local highway needs. If a closer relation could be developed between the State and county highway departments, it would assure a better supply of scarce items in future emergencies. A similar peacetime determination of overall highway equipment needs on a state-wide basis would be helpful to highway departments and equipment manufacturers in designing equipment on a functional basis to meet specific road maintenance needs.

Meet Disaster Emergencies

For peacetime emergencies or disasters, it would be most helpful if by preliminary arrangements the State, counties and townships could establish a framework under which mutual aid with equipment, manpower and materials could be provided for conditions such as recently occurred in the snow-covered areas of the west. A bridge in the path of a flood is just as subject to a wash-out whether it is under State, county or town control. Repairs could be made with dispatch and economy if a common stock pile existed in a state on which all highway departments could draw for a portable bridge.

Economy in some of the more normal maintenance operations could also be realized through joint cooperation of the highway departments. The duplication of investments in spare parts and spare parts warehousing could be avoided if all the highway departments could draw on a common equipment repair parts inventory at well-planned locations throughout a state. The storage of asphalt in tanks available to all highway departments in a designated area would avoid storage duplications. A state highway department practice of notifying a county of the time when its crushing plant would be located in the county, so as to give the local highway department an opportunity to buy some of the crushed stone, would save money on county road maintenance operations.

Joint training programs would make available to local highway departments skilled personnel and the advantages of improved methods and procedures. The operators could be more thoroughly trained to understand the proper care of specialized equipment, often costing up to $20,000 per unit, which is assigned to their use.

Borrowing Special Crews

The opportunity to borrow specialized maintenance crews for short periods of time by county and other local highway departments which did not have enough of the class of work for year-round operations would be advantageous and effect reductions in maintenance costs. As an example, loan of a bituminous surface treatment crew, a centerline-marking crew, a bridge-painting or a pavement mud-jacking crew, etc., where only a small amount of that type of work was available in the county, would be very helpful.

A further mutual aid could be the development of a system by which the counties rented equipment from the state or other county highway departments. The smaller counties cannot always afford to buy a piece of equipment for part-time or seasonal work or for occasional extraordinary maintenance operations. Bituminous distributors, road magnets for picking up metals to avoid potential tire punctures, earth-loading equipment and large tractor units may be in this category. This would be very helpful in furthering the mechanization of road maintenance work and in the full-time utilization of equipment. The cost of equipment ownership would then be spread out over a number of local highway departments.

Shops and Shop Tools

The equipment used in maintenance operations is only as effective and economical as the efficiency of the repair shops that back up those operations. A long equipment "down time" for repairs ties up the financial investment in the mechanical units and the men employed in the road operations and also delays the work to be performed. Repair shops that are not centrally located to properly service a road maintenance area cause further delays in equipment-hauling time. Some of the State highway department shops, like Topsy, "just grew" without the benefits of functional design.

Here is an opportunity for joint studies and cooperation between State and local highway departments to develop major repair shops with modern shop layouts and working conditions and tools to perform the major repairs and equipment overhauling of all highway departments in the area for which the shops were planned. Such major equipment repair depots could be operated by the State and the facilities

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Take this water pipe job for example — Five miles of 48 inch steel pipe laid 8 feet deep on the average and finished three months ahead of time. The big, powerful, smoothly operated K-360 Link-Belt Speeder, ate its way into the hard pan steadily with "effortless ease". The 35 foot, 4 ton lengths of pipe were laid to rest with precision, and quickly! And the usual owner's comment, when the job is done, "My next machine will be another Link-Belt Speeder".

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Demos Bros. of Springfield, Mass., used this Link-Belt Speeder K-360 with 1¼ yd. clamshell for digging trench 8 ft. deep, 8 ft. wide. With sling the same machine placed the huge pipe sections.

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made available to the counties, towns, townships or other highway maintenance organizations at cost. This plan would make trained mechanics available to all highway departments within the area and avoid duplications of effort and investments in the shops. Satellite shops and yards for small repairs, warehousing and office space could be developed according to needs and means of the individual highway departments and operated by them.

PRA studies of existing shop provisions of 7 state highway departments, which grew over a period of years and were not necessarily designed on a functional basis to take advantage of modern mechanization or to provide the latest working conditions, show considerable variation in the shop space provided. The average covered shop space was 60 sq. ft. per equipment unit serviced. It varied from 35 to 102 square feet for individual states. The largest floor space was provided in an extremely northern state where heated space must be provided for snow equipment during the winter months. The average shop floor space provided per mile of road maintained was 10 sq. ft. It varied between 5 and 41 sq. ft. in individual states.

The central or major repair shop could perform all major overhauls; could inspect all motorized equipment at least once a year; and should have sufficient machine shop, welding, blacksmith, tire repairing and painting equipment to do major rebuilding.

The recently constructed repair shops of one of the State highway departments, which has made an extensive study of the most modern methods, has an overall dimension of 300 x 300 ft. and covers 2 acres of land. It is the principal service shop for 2,150 major pieces of equipment.

The problem of maintenance equipment repair facilities requires careful planning and a good knowledge of the experience of other highway departments to avoid inefficiencies. Not only is this true of the principal shops for major repairs but also of the smaller satellite units which might be used to make minor equipment repairs and for warehouse use and office facilities for local highway departments. Unorganized counties or other local highway departments need help to determine the best facilities for their purpose.

Many a county or township highway engineer, housed in the basement of a county courthouse or town hall, has had visions of his own building with a small shop, equipment yard, warehouse and office space where he would feel organized as a going concern. A set of plans and estimates of the cost of such facilities, authenticated by the State highway department as representing the most efficient ideas on the subject, would do much in assuring approval of funds for the purpose from county commissioners.

Suitability and Quantity

Another item that raises or lowers the cost of maintenance is the suitability and quantity of equipment used. The selection of an expensive piece of equipment which is not the most suitable type to perform the work raises the cost of maintenance or results in part of the work not being done. The selection of too many pieces of equipment for a specific operation results in only part-time utilization of the units. Mutual exchange of experience between local highway departments or the development of some kind of a yardstick to determine whether they have a proper equipment balance for efficient maintenance performance is desirable.

Last year I prepared and presented to this group a list of average equipment used by the 48 State highway departments to maintain 1,000 miles of highways. This was compared with a list of equipment used by 28 counties selected by field engineers of the Public Roads Administration as representative counties and having a high quality of road maintenance performance. That study disclosed that the State highway departments were using equipment costing $1.02 new to perform $1.00 of maintenance work. The 28 counties were using equipment costing $1.28 new to perform $1.00 of maintenance work.

(*Continued on page* 82)

Table I

Average Equipment, Personnel and Expenditures Maintenance of 1,000 Miles of Highways

	States	Twenty-eight Selected Counties	All Counties
Annual Maintenance Expenditure	$655,000	$197,000	$169,000
Average Personnel Employed	175	68	57
Equipment Used—Cost New	$668,450	$253,450	$196,000
Equipment Used—Horsepower	10,207	4,280	2,714
Equipment Cost New per Maintenance Dollar Expended	$ 1.02	$ 1.28	$ 1.16
Equipment Cost New per Man Employed	$ 3,820	$ 3,727	$ 3,439
Equipment Horsepower per Man Employed	58	63	48
Annual Maintenance Expenditure per Man Employed	$ 3,743	$ 2,987	$ 2,965

Surface Types	Miles	Percent	Miles	Percent	Miles	Percent
1. Unimproved (nonsurfaced)	170	17	570	57	570	57
2. Soil-aggregate (gravel or equivalent)	250	25	350	35	360	36
3. Low-type bituminous or better	580	58	80	8	70	7
Total	1,000	100	1,000	100	1,000	100

Table II

Equipment Used by Average County Maintenance Department per 1000* Miles of Highway

Type of Equipment	No. of Units	Estimated Horsepower	Estimated Cost New
Automobiles (Incl. station wagons and pickups)	2.0	182	$ 3,200
Compressors, Air	0.3	16	900
Graders, Motor	7.2	374	57,600
Graders, Tow (Incl. maintainers)	2.5	....	6,250
Loaders	0.8	27	2,000
Mixers	0.5	14	900
Mowers	1.5	....	2,250
Plant, Crushing	0.2	22	3,000
Plows, Snow (Displacement type)	3.9	....	3,900
Rollers, Power and Pull	0.8	30	4,000
Shovels, Power (Cranes, etc.)	1.3	98	16,900
Tractors, Crawler and Wheel	4.4	253	36,300
Trailers	0.4	....	1,000
Trucks (All types)	16.9	1,691	51,300
Welding Machines	0.1	5	260
Unclassified equipment	3.1	2	6,430
Total	45.9	2,714	$196,190

Total Maintenance Expenditure (Average) $169,000
Ratio of Equipment Cost New to Expenditure $1.16
*Mileage Unit consists of highways with surface types as follows:

Surface Types	Miles	Percent
1. Unimproved (non-surfaced)	570	57
2. Soil-aggregate (gravel or equivalent)	360	36
3. Low-type Bituminous or better	70	7
Total	1,000	100

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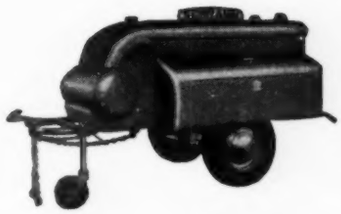

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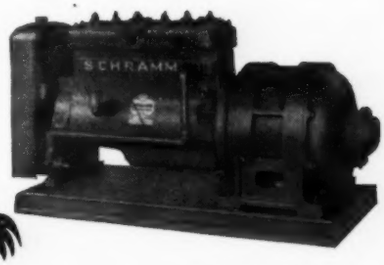

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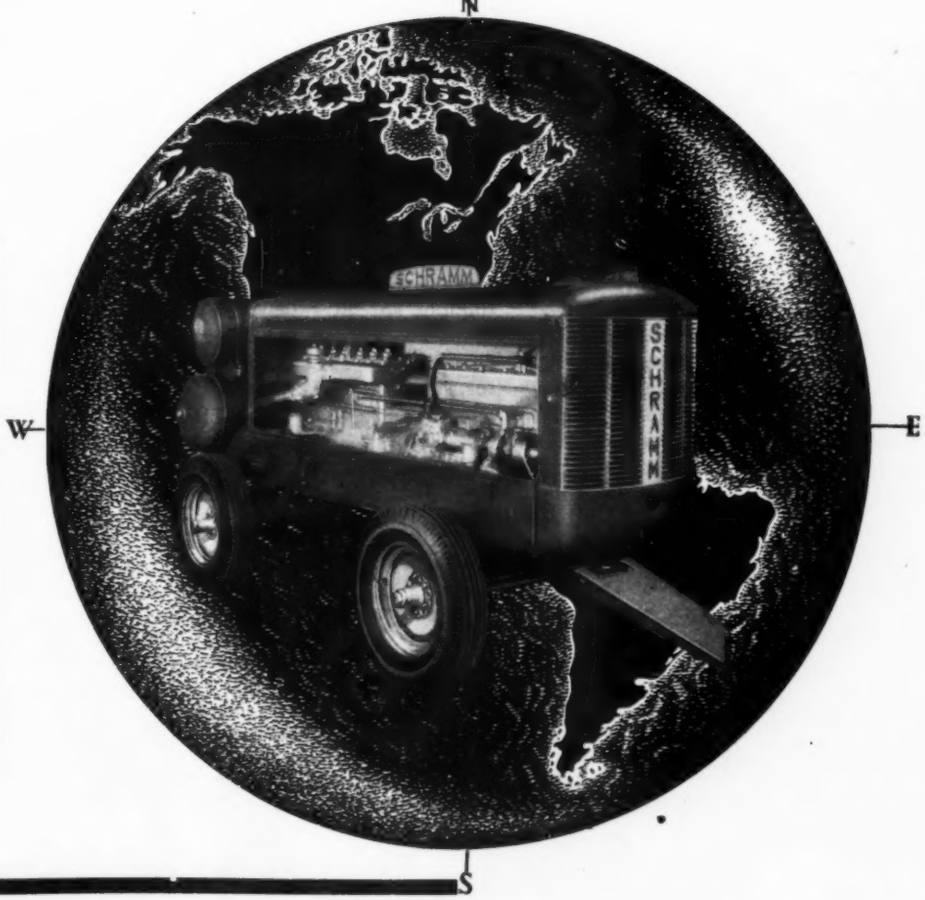

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★ Paving crew vs. traffic, a never ending battle. Unloading of miscellaneous supplies was done between streetcars

Too Much Traffic, Too Little Cement

Twin Headaches on Chicago's Halsted Street Widening Project

Paver used in midst of dense traffic. Mobile loaders working from portable batch plant speeded curb and walk work

By Harold M. Maxwell
Special Correspondent

CHICAGO'S busy Halsted Street between the "Loop" and the stockyards is too narrow and too rough. Two streetcar tracks, granite block pavement strips, slow-moving trucks and parked cars combined to make this old 42-ft. roadway "the street Chicagoans liked to drive on least."

Last summer, despite a serious cement shortage, 1¾ miles of Halsted Street was repaved and widened 4½ feet on each side. The $480,000 project was financed by the City of Chicago with motor fuel tax money. Fortunately, no buildings had to be moved because the added roadway width was taken from the existing sidewalks. The old 12-ft. walks were replaced by new 7½-ft. walks. The granite block pavement strips were replaced with 10-in. reinforced concrete except in the Chicago Transit Authority area between the rails. This area is still "rough and rugged."

Traffic Troubles

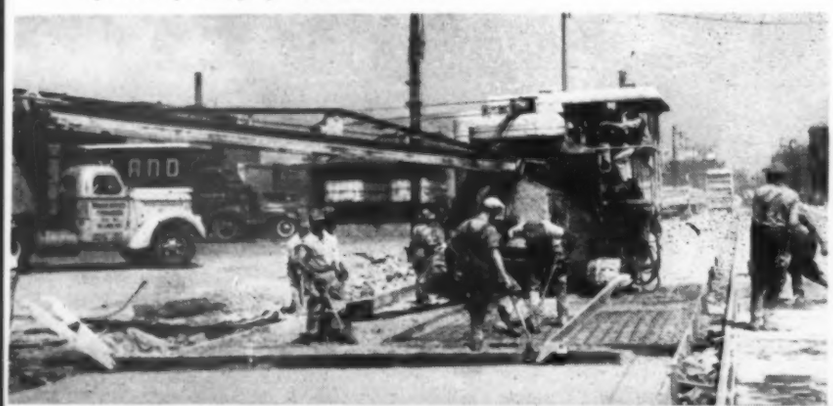
Streetcars, trucks and autos did their best to make the contractor unhappy. Like the U.S. mail, they had to go through, or at least their drivers thought so. Streetcars were allowed to pass both ways under a supervisor's direction. Paving, curb-and-gutter, and sidewalks, were concreted one side at a time, and traffic on that side detoured around the block. At first, some truck drivers who used Halsted Street regularly didn't seem to understand the flagman's signals. Later, though, they "caught on." According to the concrete foreman, the trouble ended when one particularly stubborn offender was removed from his truck by a couple of husky concrete workmen.

As on most street jobs there were many utilities to be relocated. City and power company forces relocated water mains and power ducts before the excavation contractor started removing pavement and sidewalks. The power company's and city's gas and sewer relocation crews worked a block or two ahead of the shovel. The Chicago Transportation Authority moved its trolley poles, and the city moved the lights attached to them.

Removing the "Brow"

The existing granite block in the track zone, and old curb, gutter and walk were uplifted and broken with a 1¼-yd. shovel and loaded into

★ A Rex 34-E dual drum paver placed concrete one side at a time. Note area just outside the rail. This strip was paved separately by the sidewalk crew



END ANNOYING AND EXPENSIVE SPRING BREAK-UPS THE SOIL-CEMENT WAY

SPRING break-ups make many low-type roads and streets almost impassable with mud, ruts and potholes. Such conditions vex motorists, overburden maintenance crews and require costly repairs that gall taxpayers—who foot the bills.

Troublesome spring break-ups need not be a problem. You can end them by paving with soil-cement, the easy, economical way to obtain dependable, all-weather pavement for light-traffic roads and streets.

Notice the difference soil-cement makes on the New Jersey street in the photo. The portion of the street in the foreground is suffering from spring break-up. The rest of the street, paved with soil-cement, is unaffected.

Since it was introduced in 1935, soil-cement pavement has demonstrated its dependability in the thousands of miles of local roads and streets that have served for years under climatic conditions in all parts of the country. Service records showing years of use with little or no maintenance expense are another reason for the growing use of soil-cement pavement.

Best of all, soil-cement pavement is inexpensive to build. Soil already on the roadway supplies about 90 per cent of the required material.

Paving operations are swift, too, frequently up to one-half mile or more a day. The necessary construction equipment can be obtained easily and local crews quickly learn the simple paving procedure.

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★ As high as 18,000 sq. ft. of sidewalk per day was concreted from this central plant, which consisted of a Johnson portable batch plant, a Jaeger 16S mixer, several Scoopmobiles for transporting concrete to place, a Scoopmobile at the plant for keeping bins filled from stockpiles, and platforms of sacked cement fed by hand

★ Some of the details of curb construction (see article), including placement of concrete from tubs to augment loader delivery

trucks. Removal of smaller debris was accomplished with D4 and D7 Caterpillars equipped with Traxcavator loaders. Palumbo Excavating Company, grading subcontractors, found jack-hammers were required only when removing the "brow." The brow, in case you wonder, is the 17-in.-wide paving strip between the edge of the outside rail and the adjacent roadway.

The entire pavement area was backfilled with 4 in. of pit-run sand spread by the front-end loaders. The subbase was shaped with a motor grader, puddled and rolled with a 7-ton, 3-wheel road roller.

The new pavement is concrete 10" by 15'5" wide on either side. Steel forms were used at the gutter edge; wood forms along the "brow," since the rail ties would have fouled the form shoes.

Where to Store Mesh?

Joe Zera, superintendent for the principal contractor, Standard Paving Company, used a Rex 34-E dual drum paver in all but one location, where lack of headroom at an underpass necessitated dump-truck delivery of ready-mix. An air-entraining agent was added at the mixer.

Wire mesh storage was a problem in this congested locality. Mesh was hauled two miles. The contractor managed to find one or two small adjacent lots between buildings, where he stored a few mats for a short time (danger of theft). As the paver progressed, trucks dragged the mats alongside the work.

Pavement concrete was screeded 2½ in. below the top of the forms, mesh laid, and the rest of the concrete placed. A mechanical finisher was out of the question because of the wood form on the brow edge and because the finisher would strike the wheels of passing streetcars. A portable vibrator prevented honeycombing along the forms. Finishing steps: strike-off tamper, bull float, longitudinal float, straight edge, hose and belt. A garden hose pulled off excess moisture.

The pavement was kept wet for 72 hours and covered with burlap or paper. Traffic was kept off 10 to 14 days, or until a favorable beam break occurred, four beams being tested daily.

"Mile-a-Day Salce"

The "brow" strip, plus 114,000 sq. ft. of sidewalk and 19,500 lin. ft. of curb-gutter, were subcontracted by Paolo Salce and Company. Because of his fast, mechanized outfit, this curb and gutter specialist is known around Chicago as "Mile-a-day Salce." Traffic conditions and a serious cement shortage problem didn't help any on this job, but even so, foreman Alphonse Santilli placed 400 ft. of curb and gutter an hour. Santilli reduced this figure to 250-300 ft. where toe forms were needed, as when working ahead of the paver. In the case of the 5-in. sidewalks, he laid 14,000 to 18,000 sq. ft. a day.

On a side street near the center of the project Salce set up his compact batch plant, consisting of a Jaeger 16S mixer, a portable Johnson low bin material batcher, and stockpiles of sand, stone and bagged cement (tarpaulin-covered). A ½-yd. Scoopmobile

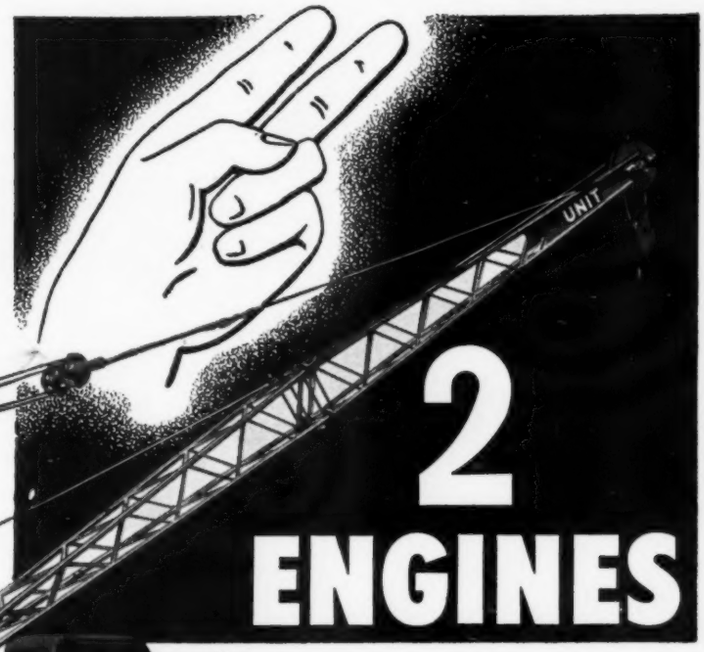
(*Continued on page* 78)

★ Sealing material was poured from a small tow-cart. Spotting reinforcement mats was quite a problem, requiring temporary storage in vacant lots and snaking through the streets as needed

UNIT 1014

10 TON TRUCK CRANE WITH DUAL POWER

BOOM IN FOLDED POSITION FOR TRAVELING



2 ENGINES

- One Engine for Speed and Mobility
- Another Engine for Lifting or Digging
- Gas or Diesel Power
- Road Speed: 32 M.P.H.
- Capacity: 10 Tons

One look at the UNIT 1014 will convince you that here is Truck Crane design at its best. Perfectly balanced, it has modern, adjustable hook-roller construction. Power flows from the truck engine in a direct straight-line drive to the tandem rear axles, both of which drive. A separate engine powers the upper structure, and may be either gas or diesel. Double, full-width outriggers provide added stability. This streamlined unit has 5 speeds forward and one reverse, with an auxiliary transmission offering 10 speeds forward and 2 speeds reverse. A road speed of up to 32 M.P.H. makes "going from job to job in a hurry" a simple matter. Large diameter, wide-faced air brakes are used on all 4 rear wheels. A hand operated, shoe type parking brake is provided on the propeller shaft. A short turning radius increases its value in close-quarter operations, and all dimensions meet highway requirements.

UNIT CRANE & SHOVEL CORP.
6407 W. BURNHAM STREET, MILWAUKEE 14, WISCONSIN, U.S.A.

● Other UNIT Models are available in ½ and ¾ Yd. Excavators and Cranes up to 15 Tons . . . Crawler or Mobile Types . . . Fully convertible to ALL attachments.

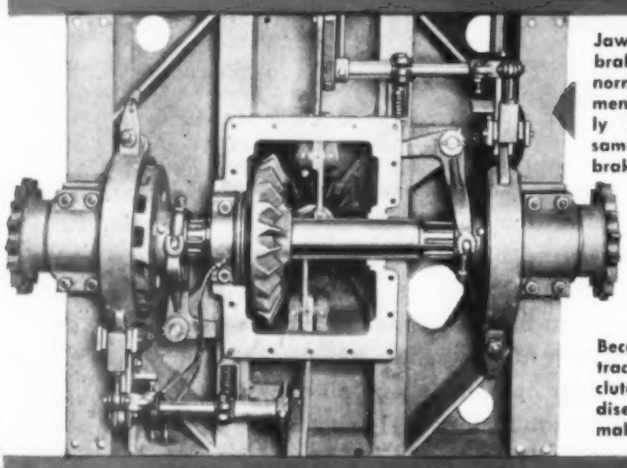
SHOVELS • DRAGLINES • CLAMSHELLS • CRANES • TRENCHOES • MAGNETS

A 5523-1P-C

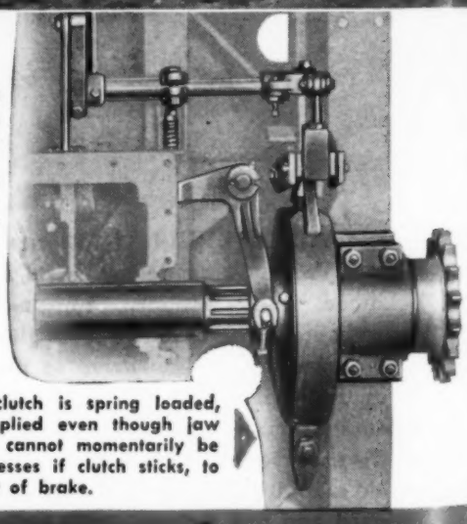
KOEHRING 205

HALF YARD

Works Safely on 30% Grade without Blocking



Jaw clutches and traction brakes work as a team. In normal operation, engagement of brake automatically disengages clutch for same crawler. Applying both brakes locks 205 securely for all operations.



Because linkage to jaw clutch is spring loaded, traction brake can be applied even though jaw clutch is locked tight and cannot momentarily be disengaged. Spring compresses if clutch sticks, to make possible engagement of brake.

HERE'S ANOTHER KOEHRING UNIT THAT WILL SAVE TIME ON YOUR DIRT-MOVING JOBS . . . HEAVY-DUTY DUMPTOR

6-yard Koehring Dumptor has constant-mesh transmission, eliminates delay for shifting gears . . . has three fast forward and reverse speeds, can shuttle from shovel to dump, eliminates turning delays . . . has instantaneous gravity dump, saves 10 to 20 seconds in unloading time every cycle. They're engineered and built to haul tough materials over rough terrain and steep grades . . . are easy to operate . . . simple to maintain . . . will give you less down-time, more work-time. Ask your Koehring distributor for complete Dumptor facts TODAY.

DUMPTOR — Trade Mark Reg. U. S. Pat. Off. K804

No blocking necessary when you're digging in on basement excavations. Safe traction brakes hold Koehring 205 Half-Yard securely.

Saves Time on Every Job

You can work safely on a 30% grade without blocking crawlers on the Koehring 205 Half-Yard. Crawlers are held by big friction brakes, not by a pawl or jaw lock. These friction brakes provide the flexibility that's necessary to cushion brake assembly against operating shocks. That's why there's no danger of brake damage on the 205. Without blocking you will save time on any job.

Here are other advantages of the Koehring 205 Half-Yard brake and steering system:

Traction brakes can be applied at any time, on any grade. Safety spring in operating linkage lets you apply traction brakes even when traction jaw clutches are locked and cannot be disengaged. Your 205 will never run away from you on the grade.

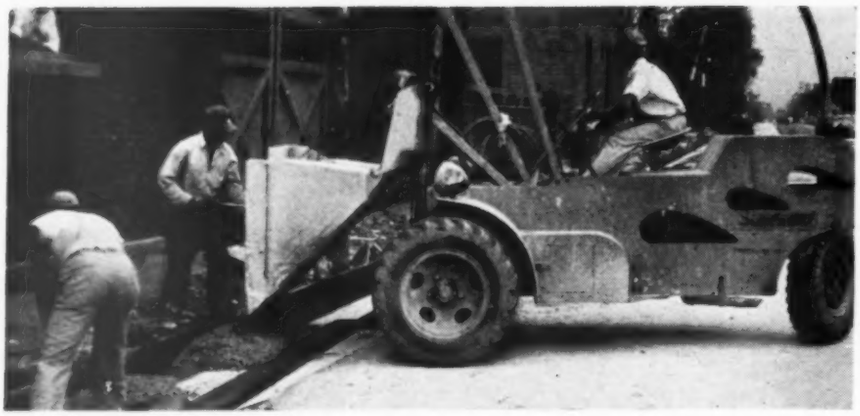
- By applying power to one crawler, and brake to the other, you can turn in a tight circle, within 205's own length.
- Easy to make wide turns under accurate control.
- Operator never leaves cab to apply traction brakes or to steer. Separate levers in cab control friction brake as well as jaw clutch for independent operation on each crawler.
- Full steering and brake control is available with cab in any position.

Your Koehring distributor can show you many other ways this versatile Half-Yard can save time, money and increase production on your excavating jobs. Ask him, too, for facts and figures on the larger 304, 605 and 1005 excavators.

KOEHRING HEAVY DUTY

KOEHRING COMPANY
Milwaukee 10, Wisconsin

Subsidiaries: JOHNSON • PARSONS • KWIK-MIX



★ The Scoopmobile units were a big factor in speedy progress on curbs, gutter and "brow" strip

(*Continued from page* 74)

kept the material hopper loaded with sand and stone. By welding 12-in. girders on a bevel around the top of the batch bin, Salce increased the hopper capacity to such an extent that one of the contractor's several Scoopmobiles could make up two batches, while others were busy hauling concrete. The weigh batcher on rails brought proportioned aggregates to the mixer skip. Mix water came from a fire hydrant.

Using a 6-bag mix, exceptional care was taken to get good concrete for curbs, gutters and walks. The material hoppers were kept loaded, but there wasn't any time for loafing. One and often two loaders shuttled to the forms through traffic. Where the haul exceeded 1,000 ft., three loaders were required to keep up with the batch-a-minute mixer. The capacity of one loader bucket was increased from ½ yd. to ¾ yd. by welding a 6-in. strip around the edge.

The 19-in.-wide integral curb and gutter section was joined to the pavement with tie rods. In addition to direct delivery of concrete for the gutter, concrete was also delivered by loader to a small trough and also to a 4 by 5-ft. steel "drag," from which the finishers wheelbarrowed concrete for touching-up purposes. One or two laborers pulled the loaded drag as the curb progressed. Concrete was thoroughly spread and smoothed with wood and metal hand floats and a 12-ft. wood straight-edge. Special floats were again used to shape gutter joints, curb face, and curb joints. After allowing the concrete to set 1 to 1½ hours, workmen removed the form clamps and curb-face forms and started final finishing. Trowels were used for final going-over, followed by an over-all brush finish. Burlap was then applied, and wet down. The following morning a second course of burlap was added and kept wet for 72 hours.

Hand excavation for the 12-ft.-wide by 5-in.-thick sidewalk was started as soon as curb forms were removed. Against the back face of the curb were placed ¾-in. expansion strips. A 2½" x 2½" angle was placed over this strip with its horizontal leg resting on top of the curb. This angle

(*Continued on page* 84)

PERFECTION

IS THE *Name to Remember* WHEN YOU WANT HOIST SERVICE LIKE THIS

"... the Superintendent of Equipment tells me he is very much pleased with the performance of the PERFECTION Model #827 hoist. He also tells me that this job pulls 18 to 21 tons of coal across the scales all day long, and dumps this weight from the time the body starts up until empty in 29 to 30 seconds, while the (another make) unit takes 56 to 59 seconds for the same load, and requires a lot of maintenance. The PERFECTION unit has not required any service or lost time at all in the 14 months it has been in service."

The above portion of a letter referring to actual performance is real evidence that the PERFECTION Iso-Draulic Roll-A-Lift is the hoist for your heavy-duty jobs. Write for data.

THE PERFECTION STEEL BODY CO.
Galion, Ohio, U. S. A.

ISO-DRAULIC ROLL-A-LIFT
* Exclusive Trade Marks
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PERFECTION STAKE and DUMP BODIES HYDRAULIC HOISTS

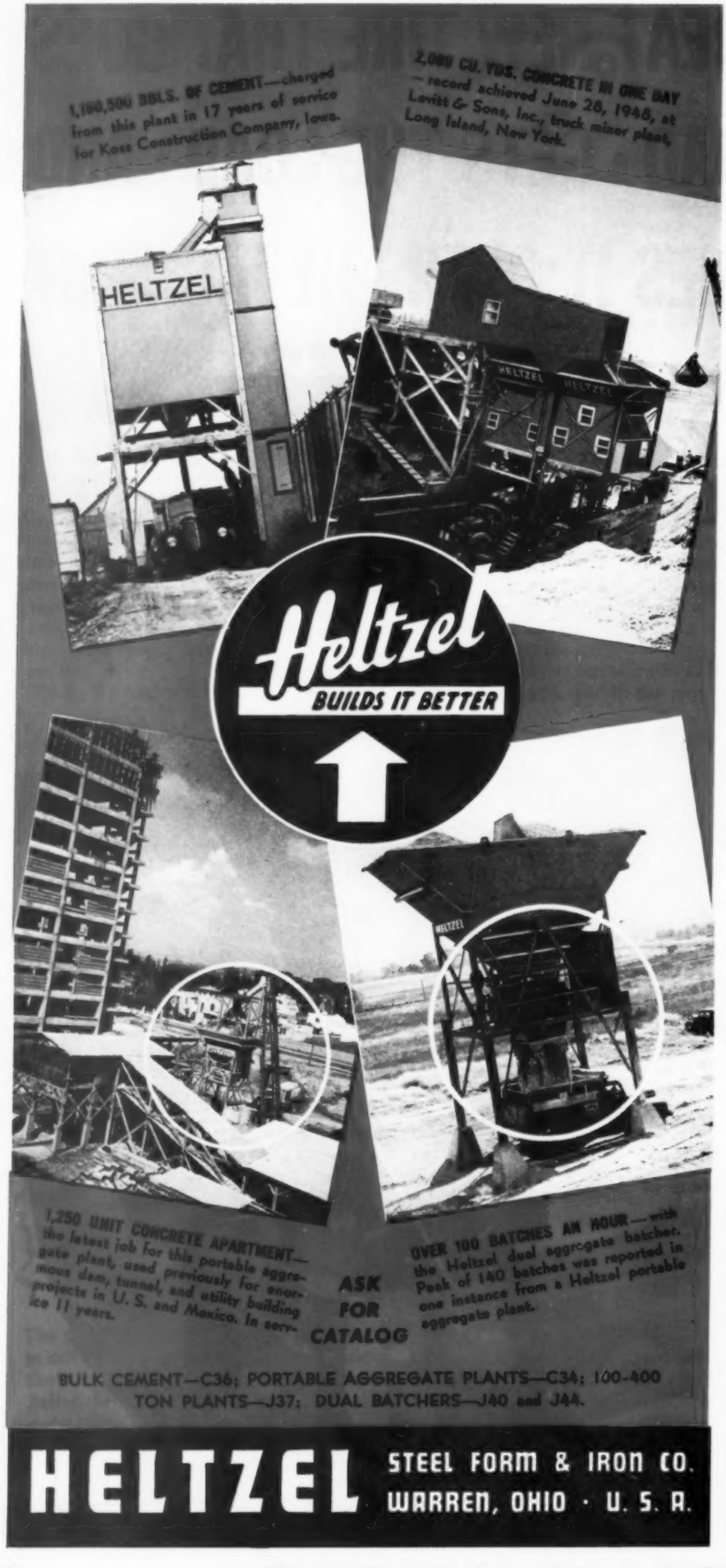
FOR ANY TRUCK STANDARD or SPECIAL UNITS IN ALL SIZES • FOR ANY USE

A GREAT NEW TIRE THAT GOES IN OFF-THE-ROAD • GETS THE LOAD • AND CARRIES IT OVER THE HIGHWAY

Here, without question, is the greatest tire ever made for trucks that work most of the time on the highway and some of the time on unimproved, rough surfaces.

A massive tire to carry heaviest loads. 50% more tread rubber; tremendous, tough shoulders, practically snag proof. With free rolling ribs for highway travel and tractor-traction cleats for soft going.

THE GENERAL TIRE & RUBBER COMPANY • Akron, Ohio


1,180,500 BBLS. OF CEMENT—charged from this plant in 17 years of service for Koss Construction Company, Iowa.
2,089 CU. YDS. CONCRETE IN ONE DAY—record achieved June 28, 1948, at Levitt & Sons, Inc., truck mixer plant, Long Island, New York.
HELTZEL
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BUILDS IT BETTER
1,250 UNIT CONCRETE APARTMENT—the latest job for this portable aggregate plant, used previously for enormous dam, tunnel, and utility building projects in U. S. and Mexico. In service 11 years.
ASK FOR CATALOG
OVER 100 BATCHES AN HOUR—with the Heltzel dual aggregate batcher. Peak of 140 batches was reported in one instance from a Heltzel portable aggregate plant.
BULK CEMENT—C36; PORTABLE AGGREGATE PLANTS—C34; 100-400 TON PLANTS—J37; DUAL BATCHERS—J40 and J44.
HELTZEL STEEL FORM & IRON CO.
WARREN, OHIO · U. S. A.

An Ominous Drought

(*Continued from page* 54)

valley (maxima dryness and warmth) will be in 1984.

There is abundant evidence of a world-wide trend toward increasing warmth and decreasing rainfall that has been going on for a century or longer. Gagings of the Columbia River begun in 1879 show this trend. Much more striking is the increasing rate of shrinkage of the Nisqually Glacier on Mt. Rainier, Washington, about 50 miles from Puget Sound. Its evidence is more outstanding because a glacier shrinks both because of decreased snowfall and because of increased warmth which go together in the case of long climatic cycles. The location of the front of this glacier in 1857 was quite well established by men who explored it then. The following are its rates of retreat in feet per annum.

	Feet/Year
1857-1885	26
1885-1892	20
1892-1918	50
1918-1928	70
1928-1938	73
1938-1948	81

Since 1918 surveys have been made annually in September. In my forthcoming booklet the retreat each year for 30 years will be given. The greatest retreat was 154 feet in 1934. The retreat in 1948 was 88 feet.

Mono Lake in California, on the east side of the Sierra Nevada Mountains, is land-locked and fed mainly by melting snows and ice in nearby glaciers. In consequence its level has tended to rise during warm periods. Thus between 1857 and 1919 it rose 50 feet, at a time when nearby tree-rings were abnormally thin much of the time. In 1914 a tree having 150 rings was drowned by the rising lake, thus showing that the temperature of the air had been increasing since before 1760. Historical evidence shows that these glaciers have been shrinking since 1850, and the smaller ones have ceased to exist. There have been halts in their retreats, due to the effects of shorter cycles of phase opposed at times to the great 603-year cycle.

The 67-year cycle has great amplitude for a relatively short climatic cycle, and its next cold-wet peak is due in 1950, yet apparently it has not reduced the rate of retreat of the Nisqually Glacier. In the next five years two other strong cycles, one of about 63 and one of about 77 years, will have cold-wet peaks, which may assist the 67-year cycle in reducing the rate of retreat of this glacier. The 201-year cycle and subcycles had

"FORD F-8 Big Jobs outperform all other trucks in their class!"

Roadside Report

FORD Bonus Built TRUCKS

JAMES L. DIGGS
KINGMAN
ARIZONA

"MY BONUS BUILT Ford F-8 Big Jobs, averaging 46,000 lbs. gross, are outperforming all other trucks in their class," reports Mr. James L. Diggs. "Gas mileage is 6 miles per gallon. The engine on one F-8 has never felt a wrench, except for changing one set of points and two fan belts. My run takes us over a mountain range and through the intense heat of the Colorado River Valley."

Mr. Diggs is one of many big-time haulers who give the Ford Big Jobs a great big hand. Owners report the 145-horsepower engine outperforms anything in its class. They offer plenty of proof that it outsaves many engines much smaller in size. Drivers report that the new Ford Million Dollar Cab can't be beat for comfort. Ford Big Jobs for '49 are Bonus Built . . . like the other 139-plus models in the full line of Ford Trucks. Bonus Built is the superstrong construction that contributes to long truck life. Life insurance experts prove Ford Trucks last longer.

ONLY THE FORD BIG JOB HAS ALL THESE FEATURES!

- ★ New 145-h.p. Ford V-8 engine for top performance.
- ★ Ford exclusive concentric dual-throat carburetor for more power, more economy.
- ★ New heavy duty 5-speed transmissions for operating flexibility.
- ★ Big Ford power-operated brakes for sure-footed stopping; rear 16-inch by 5-inch on the F-8.
- ★ Ford Super Quadrax 2-speed axle with vacuum shift for performance flexibility in Model F-8 (single speed axle also available); single-speed Quadrax Hypoid Axle in Model F-7.
- ★ Large diameter (10-inch) wheel bolt circle with 8 studs to allow for extra-strong hub construction.
- ★ Million Dollar Cab with Ford Exclusive Level Action suspension for greater driving comfort.
- ★ Nationwide service from over 6,400 Ford Dealers.
- ★ Ford Bonus Built construction for long truck life.

Gross Vehicle Weight Ratings: F-8 up to 21,500 lbs., F-7 up to 19,000 lbs. Gross combination ratings: F-8 up to 39,000 lbs., F-7 up to 35,000 lbs.

FORD 1949 *Bonus Built* TRUCKS 1949

BUILT STRONGER TO LAST LONGER

USING LATEST REGISTRATION DATA ON 5,444,000 TRUCKS, LIFE INSURANCE EXPERTS PROVE FORD TRUCKS LAST LONGER!

ELECTRIC WHEELS

Designed to do the Job

Wheels and Axles are our business, and our engineers are well qualified to recommend the most efficient assembly for your product.

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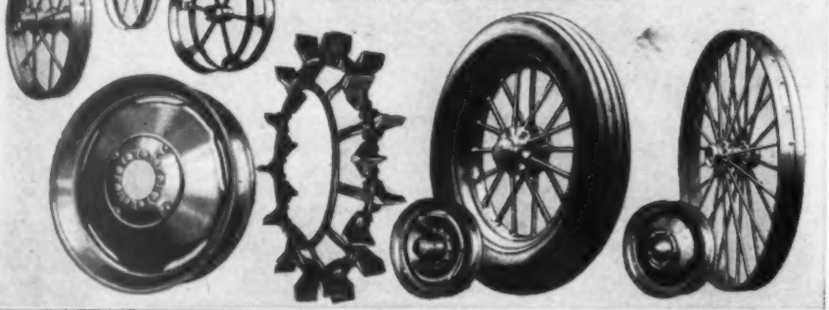
Standard or Special, ELECTRIC Spoke-type or Disc Wheels are built for most types of portable equipment.

Send us your specifications and we will submit our recommendations.



ELECTRIC WHEEL CO., 2912 Pine, Quincy, Ill.

a peak in 1883, which reduced the retreat rate of this glacier as shown in the foregoing table. The next few years probably will be abnormally cold and wet in many regions, but thereafter the trend toward warmth and dryness will resume.

Reducing Maintenance Costs on County and Local Roads

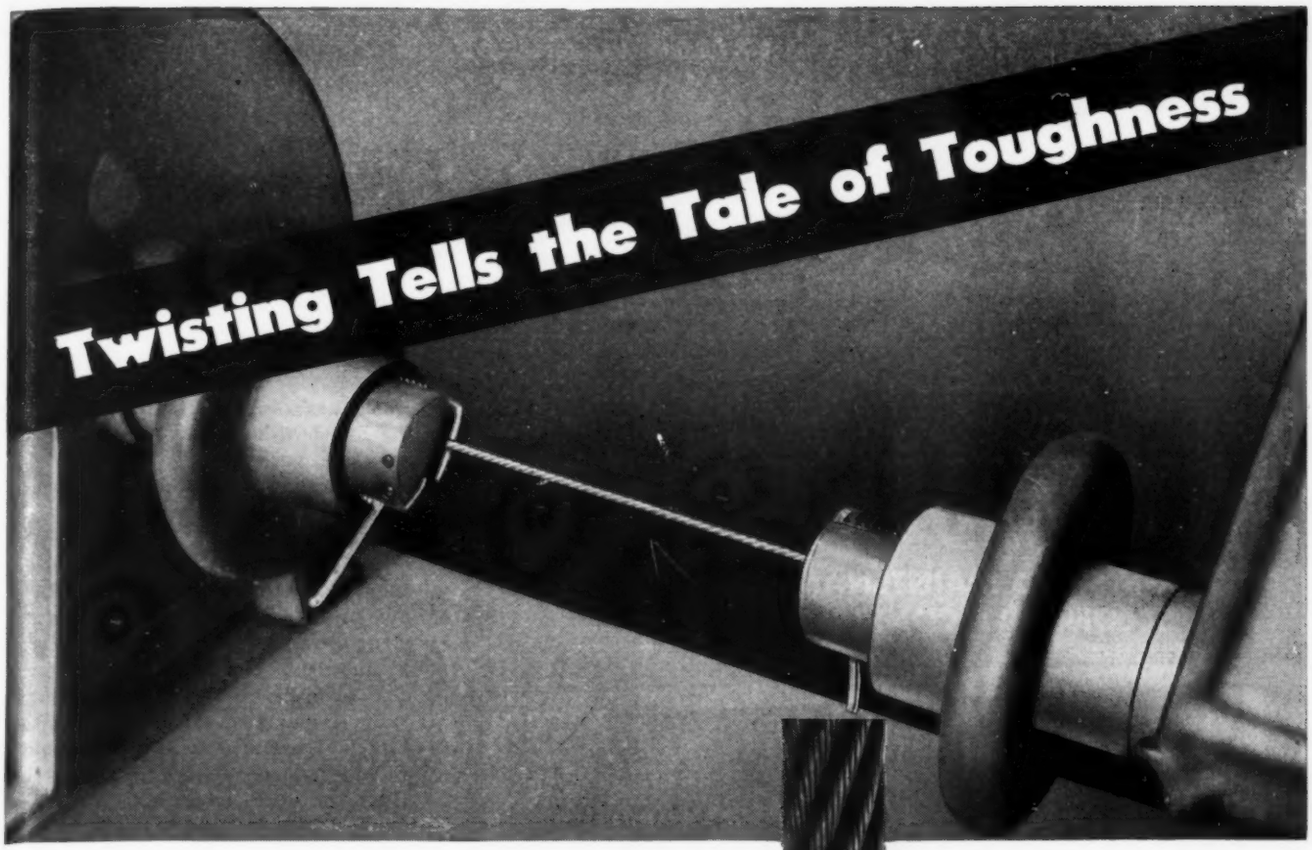
(*Continued from page* 70)

This year we have a comparison of county equipment used from a much larger number of counties. On the basis of equipment inventories obtained by the Highway Research Board from 402 counties, the new cost of the equipment used by the counties amounted to $1.16 per $1.00 of maintenance performance. (See Table.)

Table I discloses that while there was only a 17% additional maintenance expenditure in the selected counties which had good maintenance performance, they were able to employ 19% more manpower and to use equipment with 58% more power. That is, mechanical units having an average of 4.3 h.p. per mile of road maintained were used in the selected counties as against the average of 2.7 h.p. per mile on all county roads. The mechanical aids per man employed in the selected counties amounted to 63 h.p., 32% greater than the average for all the counties. This accounts for the good quality of maintenance in the selected counties and illustrates what can be done by careful analysis in obtaining a well-balanced maintenance equipment plant to perform a high quality of maintenance. It also illustrates the need for further mechanization in the less organized counties.

In Table I are listed comparable nation-wide average figures for primary state highways. The funds, manpower and mechanical equipment aids used on the State highways were much higher than on the county roads because of the weight, quantity and speed of traffic and other related factors on the principal roads. One man was assigned to the maintenance of 5.7 miles of state highways; equipment averaging 10.2 h.p. per mile was used; and each man had units totaling 58 h.p. On the 28 selected county roads, one man was assigned to the maintenance of 14.7 miles of roads; equipment averaging 4.3 h.p. per mile was used to maintain the highways; and each man had mechanical aids with a horsepower rating of 63.

In Table II the list shows fractions of equipment units. This is an indication that some of the counties did not have full-time use of units such as air



Here we see an 8" piece of rope wire being twisted on its own axis. The revolutions necessary to break the wire are counted and only those coils are accepted which test at least 10% above American Petroleum Institute specifications for wire rope. In addition to being an indication for toughness, the torsion test reveals whether the wire is free from steel defects such as seams and cups.

A routine test? Yes, but with higher standards. And every coil of wire on both ends must pass this and countless other tough tests before acceptance for use in making Wickwire Rope. It's these tests, coupled with over 125 years of wire-working know-how, that are your assurance of the utmost in performance, safety and long rope life when you use Wickwire Rope.

Wickwire Distributors and Wire Rope engineers throughout the country are ready to help solve your wire rope problems, and to provide prompt delivery of the rope you need from strategically located warehouse stocks. Wickwire Rope is available in all sizes and constructions, both regular lay and WISSCOLAY *Pre*formed.

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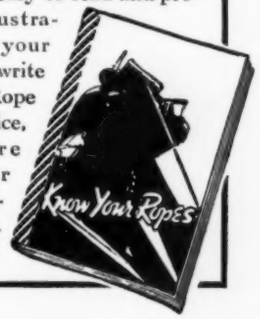

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compressors, loaders, crushing plants, rollers, trailers and welding machines. It is this type of equipment that several counties or a group of counties and the State could acquire on a shared basis. This additional mechanization should materially improve the maintenance performance on our county roads.

In Conclusion

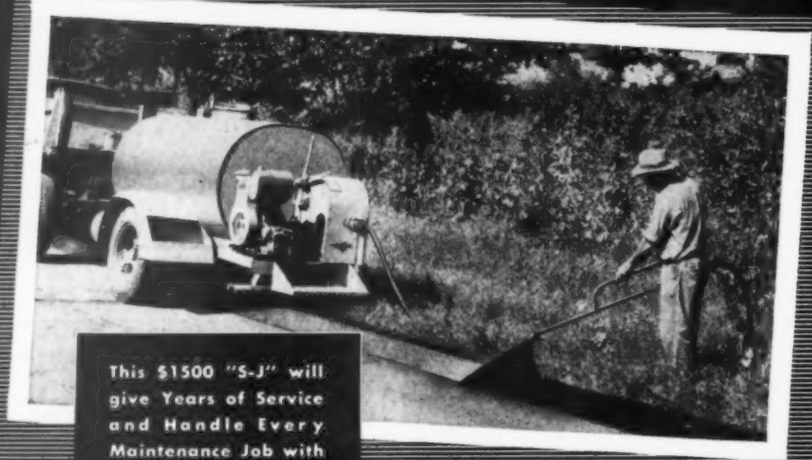
In this paper different means of effecting mutual cooperation between the States, counties and towns, townships or special highway districts have been discussed. Any one or a combination of these should result in more efficient and economical maintenance. Some of the cooperative measures would perhaps require additional legislative authority. It is, however, often said that necessity is the mother of invention. Here, the necessity for reducing the large percentage of highway funds expended for maintenance is the necessity for cooperation.

●

Michigan Spends $91,000,000 on Trunkline System—During the last 5½ years the Michigan State Highway Department has constructed 1,678 road and bridge projects in the state trunkline highway system at a total cost of some $91,000,000.

STANDARD STEEL "S-J"

FOR HIGH SPEED MAINTENANCE—PATCHWORK OR SECONDARY CONSTRUCTION . . . . .



This $1500 "S-J" will give Years of Service and Handle Every Maintenance Job with No Time Lost . . . .

THE STANDARD STEEL "S-J" CAN BE HAD TRUCK MOUNTED OR DUAL WHEEL TRAILER MOUNTED

Users from coast to coast find the Standard Steel "S-J" is like a "highway patrol car". Easy to move for emergency patching — economical to operate on all maintenance jobs. The entire cost of an "S-J" can be paid for many times over in a single-season with years of operating value in it. Think of the profit you can make on every type job from patching to building drives, playgrounds, sealing streets, airports, etc. Here is the equipment to use for fast action at low cost in all maintenance and secondary construction work.

WRITE FOR CATALOG "S-J"

OTHER PRODUCTS

Asphalt Pressure Distributors, Tar Kettles, Patch Rollers, Supply Tanks, Tool Heaters, Asphalt Tools, Street Flushers, Construction Brooms.

Built to the Highest Standard

SJ-3

Standard Steel Works

Expressway Construction Progress in American Cities

(*Continued from page* 62)

ing an elaborate "Point Interchange." The Point is eventually to be transformed into a historic national shrine, for which 34 acres of land now occupied by industrial and rail facilities will be cleared. Another 23 acres will be redeveloped by industry.

Lou Capone is project manager on the tunnel job, C. N. Taylor, superintendent, and Donald Phinny project engineer for the contractors. E. A. Rush, ass't. construction engineer in the Pittsburgh district has charge for the state, with G. Riley resident engineer on tunnel work and D. Malone engineer on approaches.

Michael F. Baker, consulting engineers, are serving as consultants on the Parkway, with George S. Richardson as consulting engineer on all structures. Ole Singsted, New York, is consulting engineer on the tunnel. The program is under the Pennsylvania Department of Highways, Ray Smock, Secretary, and E. L. Schmidt, Chief Engineer. J. P. Ambler, District Engineer at Pittsburgh, is in immediate charge.

Too Much Traffic, Too Little Cement

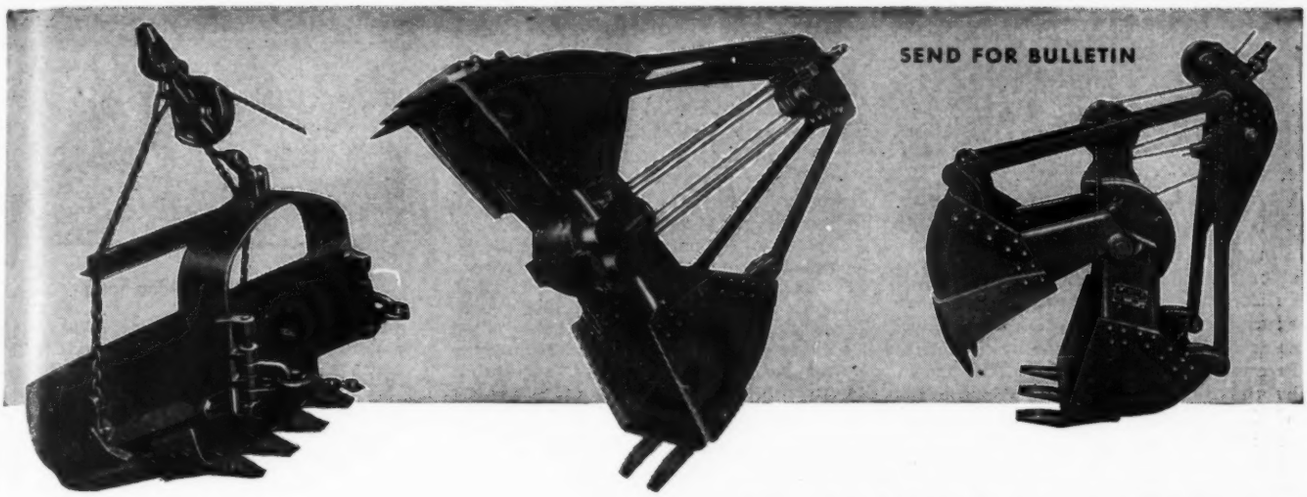
(*Continued from page* 78)

was only a temporary measure, but it provided a neater joint and prevented debris and concrete from falling between the expansion strip and the previously poured curb and gutter section.

The subgrade was thoroughly wet down, concrete spread with shovels, and the surface struck off by two men with 8-ft.-long straight-edges. Further spreading and smoothing were obtained with a 6-ft.-long "Darby." Floats and trowels were used for final finishing. The angles placed over the curb joint were removed and the joint reshaped. Transverse dummy joints at 5-ft. intervals were formed by laying a 1" x 6" wood guide at the desired location and running an edger alongside. Curing was same as for curb and gutter.

Paving the 17-in.-wide brow was the simplest job of all. A ½-in. expansion strip was installed along the previously completed pavement slab. Concrete was again supplied by the mobile loaders and spread with shovels.

This project is under Lloyd Johnson, commissioner of streets and electricity. Otis A. Rogers was resident engineer.



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Williams Type BUCKETS

● Count on longer life and more efficient service ... due to Wellman original **welded rolled steel construction.** You get the maximum digging power, and exceptional strength—without excessive weight! Specify Wellman, and you'll specify the best bucket for your purpose.

THE WELLMAN ENGINEERING COMPANY
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SAVE

Don't throw away your worn out tractor wheel—save the expensive splined hub

SAVE

Any experienced welder can install a new Pacific rim at a great saving.

SAVE

You gain a better than new tractor wheel that will give longer service life.

BEFORE
The rims are worn out, but the splined hub can be re-rimmed many times.

AFTER
A new tractor wheel with tough, wear-resistant Pacific manganese steel rim.

● Tested and proved method of securing extra long rim life—hundreds of users

● Saves expensive splined hubs

● Quickly installed by any experienced welder

● Manganese steel has no equal for long wear

● Down-time for replacements kept at absolute minimum.

Pacific RENEWABLE, MANGANESE STEEL
TRACTOR WHEEL RIMS
For Caterpillar "Track Type" Tractors

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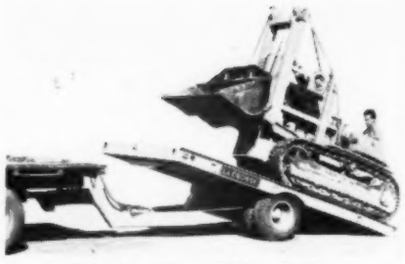
NEW EQUIPMENT AND MATERIALS

Colored Concrete on Highway Leadoffs 300

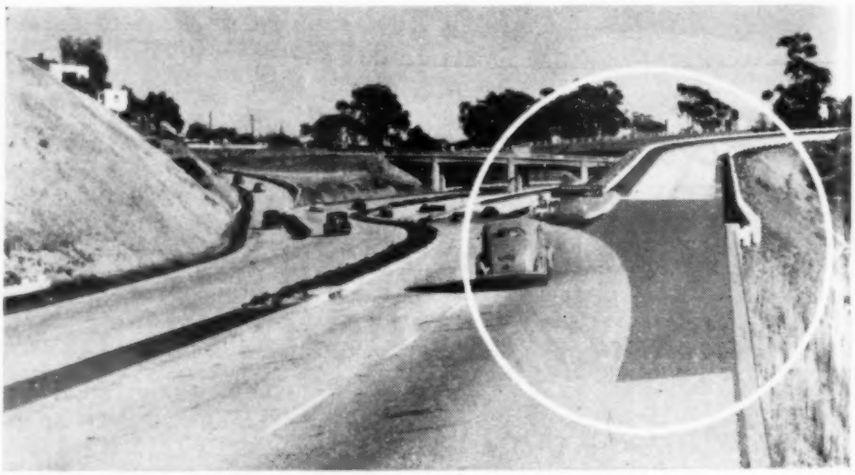
In an effort to reduce traffic accidents along heavily traveled highways, the California State Highway Department has approved the application of concrete coloring to sections of the new Gabrillo Freeway entering San Diego. As shown by the illustration, the coloring is applied to highway leadoffs, thus making them more easily visible to approaching motorists who are thereby given ample time to get into the proper lane. The coloring material used on the job was Kemiko concrete stain, a product of Rohloof & Co., Los Angeles 27, Calif. This stain through extensive tests was found to offer extended visibility, reduction of glare, and extreme durability despite heavy highway traffic. An important feature claimed for this coloring material is that it is not surface paint but a chemical solution which penetrates the pores and through chemical reaction becomes a permanent part of the concrete itself. The color selected for the Gabrillo Freeway is a deep reddish brown. It was applied by Bashet Brothers Construction Co. for the San Diego County Road Department under the supervision of E. E. Wallace, District Engineer.

Trailers 301

Two new tilting trailers have been announced by La Crosse Trailer Corporation, La Crosse, Wis. Manufacturer reports both trailers can easily be loaded or unloaded by one man without skids or blocks; and can be used behind any standard ½ to 1-ton truck equipped with standard pintle hook. Model TSA-2 has 8 to 10-ton capacity with 96 in. x 187 in. platform, riding on a single axle with 2 wheels and 4 900x15 or 10.00x15 tires. Double-acting hydraulic cylinder "cushions" trailer platform when being tilted with or without load. In addition, one-piece axle and drawbar are removable, permitting use as pole trailer, etc. Lower priced La Crosse model LTA-4 has 6 to 8-ton capacity with 78¼ in. x 124½ in. platform, riding on a tandem axle with 4 wheels and 4 7.00x20 tires. Entire trailer tilts for loading by removing pin from hinged drawbar. Weight of load



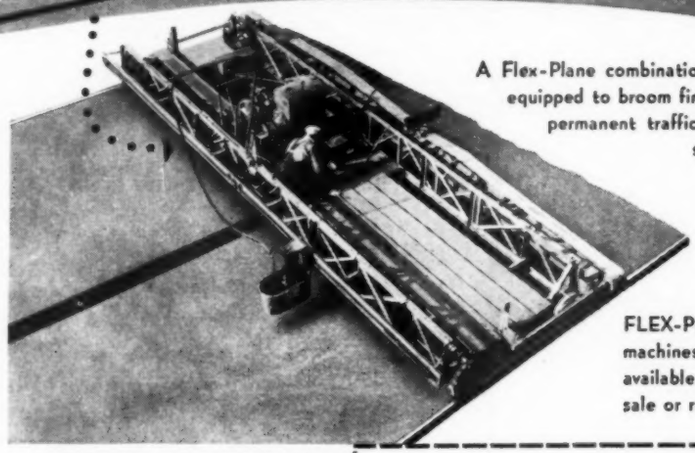
New 8 - 10-ton Tilting Trailer



Colored Leadoff on New Gabrillo Freeway in San Diego County, California

MECHANIZE BEHIND THE FINISHER

• With Flex-Plane equipment you can mechanize the entire paving job . . . the modern high speed Flex-Plane finisher needn't outdistance the miscellaneous "end" jobs. The Flex-Plane mechanical tie-bar and dowel spotter, the vibratory joint machine and the combination spray machine will crowd the fastest paver. The completely automatic combination machine can broom, belt or drag burlap, install permanent traffic lines and spray cure. Don't let outmoded methods retard jobs nor run away with costs. For full information, return the coupon from this ad.



A Flex-Plane combination machine equipped to broom finish, install permanent traffic lines and spray cure.

FLEX-PLANE machines are available for sale or rental.

COMBINATION MACHINE:
• BROOMS, BELTS OR DRAGS BURLAP
• INSTALLS PERMANENT TRAFFIC LINES
• SPRAY CURES

FLEX-PLANE
WARREN OHIO
(FLEXIBLE ROAD JOINT MACHINE CO.)

Send me full information on:

_____ Flex-Plane spray and combination machines.
_____ Flex-Plane vibratory joint machine.
_____ Flex-Plane mechanical dowel and tie bar spotter.
_____ Flex-Plane finishing machine.

*Name*_____
*Company*_____
*Address*_____

Mail to FLEX-PLANE, Warren, Ohio

brings trailer down into position, after which pin is inserted and trailer is ready to move.

Shoveloader 302

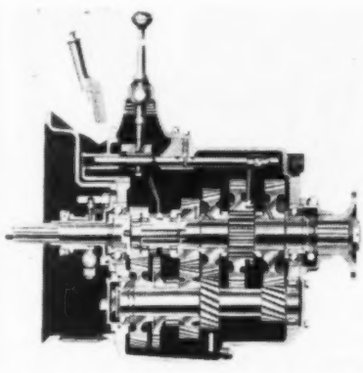
A new model 3-A shoveloader for mounting on the Case VAI tractor has been announced by the Lull Manufacturing Co., 3612 East 44th St. Minneapolis 6, Minn. Outstanding features claimed for the new Model 3-A include

Lull Model 3-A Shoveloader

automatic "scooping action," split-second or slow dump, and the unique design which keeps the load in balance and free from spillage after the bucket is filled. The loader has a maximum lifting capacity of 1,800 lb. and can be equipped with either a ⅝ cu. yd. material bucket or a ¾-1 cu. yard snow bucket.

Transmission 303

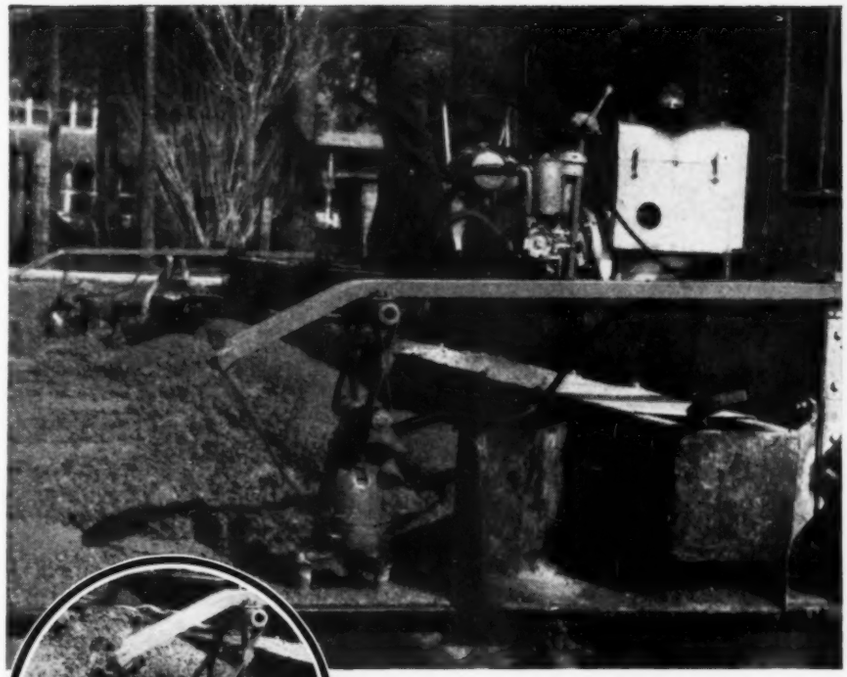
With the recent introduction of its new 4-speed transmission, Model 4-A-112, the Fuller Manufacturing Co., Kalamazoo, Mich., now offers a complete series of four, five, and ten-speed transmissions for use with engines of up to 1120 cu. in. displacement. This newest Fuller transmission is designed for both on and off-highway applications where a high percentage of operation through



Model 4-A-112 Fuller Transmission

gears in conjunction with auxiliaries is required. It is claimed to be especially applicable to earth-moving machinery.

Model 4-A-112 is based on the proved design features of Fuller's Model 5-A-1120. High capacity in the new model is stated to be insured by the use of helical gearing in all four forward speeds. The helical gears, easily engaged by sliding jaw clutches, permit easy shifting and reduce driver fatigue. Extra-heavy bearings are used throughout the Model 4-A-112. In combination with a three-speed auxiliary transmission, Model 4-A-112 provides 12 forward and three reverse speeds. When used with a two-speed auxiliary, eight forward and two reverse speeds are obtainable. Model 4-A-112 also offers a wide range of ratios, with optional second and reverse speeds.



JACKSON

SIDE FORM VIBRATOR FOR CONCRETE PAVING

SAVES BETTER PART OF 2 MEN'S LABOR

This machine, which may be mounted on any modern finisher, Jackson Vibratory Paving Tube or spreader, employs two vibratory units that are simultaneously lowered into or raised from the concrete through controls on the deck of the finisher or spreader by the regular operator. It eliminates manual vibrating of concrete at the side forms.

INSURES A BETTER JOB . . . . . .

Vibrators operate well ahead of front screed of any finisher, will operate close to forms or reinforcement without fouling, will ride over any obstruction encountered and will NOT penetrate through the concrete into the sub-base. Thorough compaction is assured regardless of speed of finisher or spreader. In reverse travel, vibrators may be elevated or left in concrete without damage to concrete or equipment. NO SPOTS WILL BE MISSED WHERE THIS MACHINE IS USED.

RUGGED—TROUBLE-FREE . . . . . .

Vibrators are electric vibratory motors in which the vibratory medium is an integral part of the motor. Vibration is transmitted to a simple loop of steel tubing bolted to the lower end of the motor. Thus all flexible shafts or long rigid shafts, which can be a major source of trouble, have been eliminated. Motors are exceptionally rugged, having been proved in more than 25 years of severe service. Power is supplied by reliable Jackson Power Plant on the finisher or spreader deck.

Nothing approaching the efficiency of this machine has ever before been offered for this purpose. Write for the complete facts, NOW!

OTHER MONEY-MAKING PAVING EQUIPMENT

Jackson Vibratory Paving Tubes for vibrating full slab-widths of highway and airport paving; Jackson Municipal Paving Unit (manually guided electric vibratory screed and power plant); Vibrators for every type of paving and construction.

Manufactured by ELECTRIC TAMPER & EQUIPMENT CO. for

JACKSON VIBRATORS, INC., LUDINGTON, MICH.

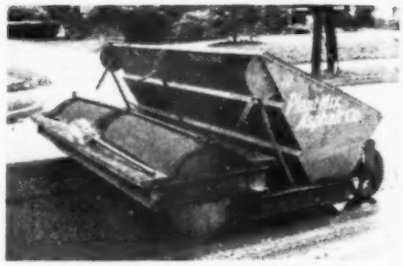
Bulldozer and Trailbuilder 304

New bulldozer and trailbuilder equipment for use with Allis-Chalmers HD-19, HD-14 and HD-10 tractors has been developed by Southwest Welding & Mfg. Co., 3201 W. Mission Road, Alhambra, Calif. These new units have eliminated the overhead "A" frame structure. They are now the radiator guard type mounting—extremely rugged and dependable. They can be furnished for either rear or front-mounted control units.

New Bulldozer Equipment

Bituminous Spreader 305

A new light weight spreader for laying plant mix bituminous paving materials has been developed by I. J. Overman Manufacturing Co., 3301 South Torrance St., Marion, Ind. The spreaders are made in two sizes to provide for 8 and 10 foot spreads. Each spreader is equipped to regulate the spread from 1 to 4 in. in depth. The spreader is towed behind dump truck which feeds the materials into the spreader box and preliminary compaction is obtained by adjustable rollers attached to the rear of the spreader itself. The adjustable rollers are stated to make an even contour of the pavement, either with or without a crown. In transit to and from the paving jobs, the spreader is attached by chains to the dump truck in such a manner that the rollers are raised from the roadway and the spreader is moved at truck speed on rubber wheels mounted on the front of the spreader.



Light Weight Bituminous Spreader

Truck Tire 306

A new type tire has been added to the truck tire line of The Goodyear Tire & Rubber Co., Akron, O. Known as the Hard Rock Rib, the tire is currently being manufactured in three sizes, including 12.00-24, 13.00-24 and 14.00-24. It is designed especially for front wheel service in heavy construction, excavation and strip mining and is expected to help eliminate hard steering and vibration encountered in these types of operations. Tread design of the new tire consists of three, heavy circumferential ribs, with the shoulder pattern resembling that of the company's standard Hard Rock Lug tire. Carcass of the Hard Rock Rib is the same as that of the Hard Rock Lug.

New Hard Rock Rib Truck Tire

Paver Boom 307

A new HighLift boom is now available for both the Singlemix 34-E (single drum) and Duomix 34-E (double drum) Multifoote concrete pavers of the Foote Co., Inc., Nunda, N.Y. This boom can be controlled from the operator's platform and held in any position above the ground with a vertical lift of 23 feet bucket clearance. This allows the paver to be used in a wide variety of work such as parapets, bridge abutments, retaining walls and footings and walls for general building construction. The High-

FROM JOB TO JOB
------AT TRUCK SPEED

That's what you can do with an Eagle Loader! New contracts will demand more speed, more work for the same money. An Eagle can help you do just that.

- One-man operation.
- Handles any loose material, quickly and economically—dirt, cinders, gravel, snow, etc.

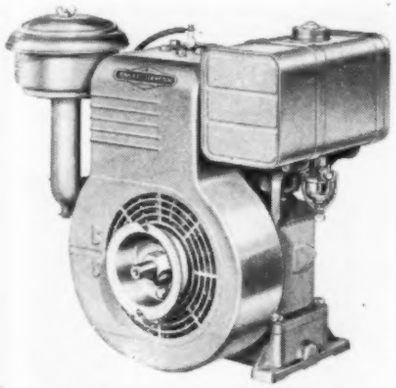
Write for more information—Dept. RS-39

EAGLE
JAW CRUSHERS • IMPACT BREAKERS
PULVERIZERS • CONVEYORS • LOADERS
CRUSHER CO., Inc. GALION OHIO·U·S·A

Lift boom will work flat and in many cases, permits working under steel structures where equipment with longer booms would find difficulty.

Gasoline Engines 308

Three new models in their current line of 4-cycle air-cooled gasoline engines have been announced by Briggs & Stratton Corporation, 2711 N. 13th St., Milwaukee 1, Wis. Model "9" is rated at 2.16 to 3.1 h.p.; Model "14", 3.56 to 5.1 h.p.; and Model "23" at 6.5 to 8.25 h.p. The ratings are based on standard I.C.E.I. procedures. Among the many new features of these models is the Briggs & Stratton magnematic ignition system. A breaker box unit, externally mounted on the crankcase, incloses easily adjustable breaker points, condenser,

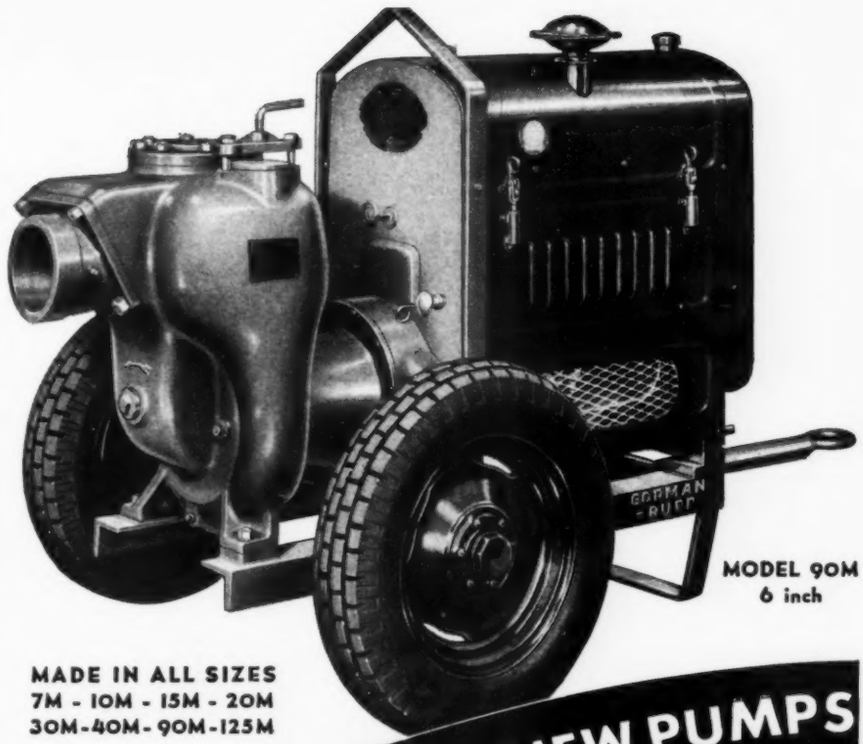


New Model Briggs & Stratton Engine

manual stop switch and remote stop switch terminal. This system produces a high voltage at very low speeds and incorporates an automatic spark retard and advance, assuring quick, easy pull-up starting—no spinning necessary. Standard engines are available with plain or ball main bearings. Enclosed adjustable governor, operating in oil, provides improved speed regulation under all conditions. A new vacuum breather and spring loaded oil seals prevent oil leaks. A handy snap-on oil filler cap eliminates necessity for a wrench when adding or changing oil. A starter rope or a hand crank, or both, can be furnished.

Swing Clutch 309

An entirely new clutch has been developed by American Hoist & Derrick Co., 63 South Robert St., St. Paul 1, Minn., and is now being furnished as standard equipment for swinging and traveling on their "American" locomotive cranes. The outside band clutch has always been an extremely desirable type due to its simplicity, efficiency, and the ease of replacing lining. The new design makes this type clutch even more desirable as it overcomes the problem previously encountered, that of keeping the band perfectly round, enabling its full surface to contact the drum. This has been done by using a double tandem clutch, which consists of two half bands rather than one full band. Each half band is actuated by separate air cylinder, both air cylinders being controlled by a single valve. With these half bands it is a very simple matter to hold proper shape during installation and keep the entire band surface in contact with the drum, thus avoiding high spots and jerky operation.



MODEL 90M
6 inch

MADE IN ALL SIZES
7M - 10M - 15M - 20M
30M-40M-90M-125M

GORMAN-RUPP'S NEW PUMPS

CHALLENGE ANY PUMP TO MATCH THEIR PERFORMANCE

With a new complete line of Contractors' Pumps, Gorman-Rupp has topped their own past high record of performance with a better pump --

-- QUICKEST PRIMING
-- HIGHEST PRIMING
-- PUMPS MORE DIRTY WATER

Compare them for priming speed:

The new Model 15M (3") primes at 25 ft. suction lift in 61 seconds.

The new Model 90M (6") primes at 25 ft. suction lift in 44 seconds.

And the Gorman-Rupp is still the most simple pump --

No ports, no valves, no clean-out plates, nothing to cause stoppages.

Write for the new Contractor's Bulletin 8-CP-11

THE GORMAN-RUPP
Guarantee

Our distributors are authorized to put a Gorman-Rupp Contractors' Pump on any pumping job, anytime, anywhere, alongside any other make pump, size for size. The Gorman-Rupp pump is guaranteed to pump more dirty water more hours, using less gasoline and to prime quicker than any other self-priming pump. If it isn't the best all around pump, our distributor will accept the return of the Gorman-Rupp pump and pay the user any installation expense incurred.

THE GORMAN-RUPP COMPANY
MANSFIELD, OHIO

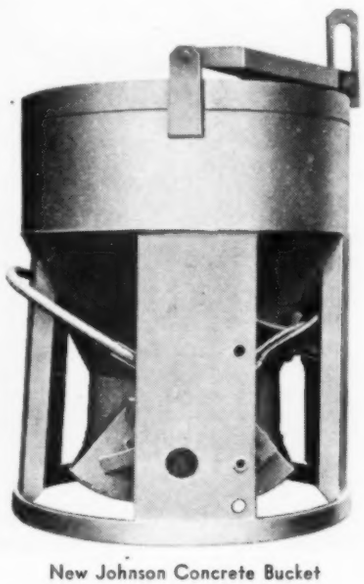
Power Wheelbarrow 310

Recent improvements on the Moto-Bug, the new power-wheelbarrow introduced by the Kwik-Mix Co., Port Washington, Wis., are stated to have increased the versatility of the machine for handling materials of any nature on construction and industrial job application. Kwik-Mix is a subsidiary of the Koehring Co. of Milwaukee. The Moto-Bug can be equipped with an optional 4-foot stake platform body that is easily interchanged with the 10-cu. ft. capacity hopper body; an optional riding step for the operator has been made available and, in addition, a dual wheel has been placed on the direct steering mechanism. Better all-around performance for the Moto-Bug is claimed by the manufacturer as a result of these changes. Adding the flatbed platform gives the machine a 1200 lb. capacity for truck handling loose loads, skids and bins. Also, the platform body may be tilted for unloading certain kinds of heavy material. In connecting the positive steering hand lever to a dual rear wheel, a differential action is achieved for more ease in guiding and spotting the Moto-Bug. The machine is powered by a standard make, 4 h.p. gasoline engine, at speeds from 1½ to 4 m.p.h. in forward and reverse directions. All wheels are equipped with traction tread pneumatic tires.

The Moto-Bug

Concrete Bucket 311

A new lo-slump concrete bucket in 2, 3, 4 and 8 cu. yd. sizes has been introduced by C. S. Johnson Co., Champaign, Ill., a Koehring subsidiary. Designed for heavy-duty requirements on big dam construction work, the new Johnson bucket has been approved for use on construction jobs supervised by government agencies. Extensive tests are stated to have shown that the bucket satisfactorily discharges mass concrete with cement content as low as 2 bags per cubic yard and slumps down to ½ in. using 6 inch aggregate. The bucket deposited these mixes without segregation. The new Johnson bucket combines the advantages of an extra large discharge opening with a fully controlled double clam discharge gate that can be operated manually or by compressed air. Completely automatic when operated by air, bucket gates close instantly when supply hose valve is released or when hose nozzle is pulled away from bucket air socket.



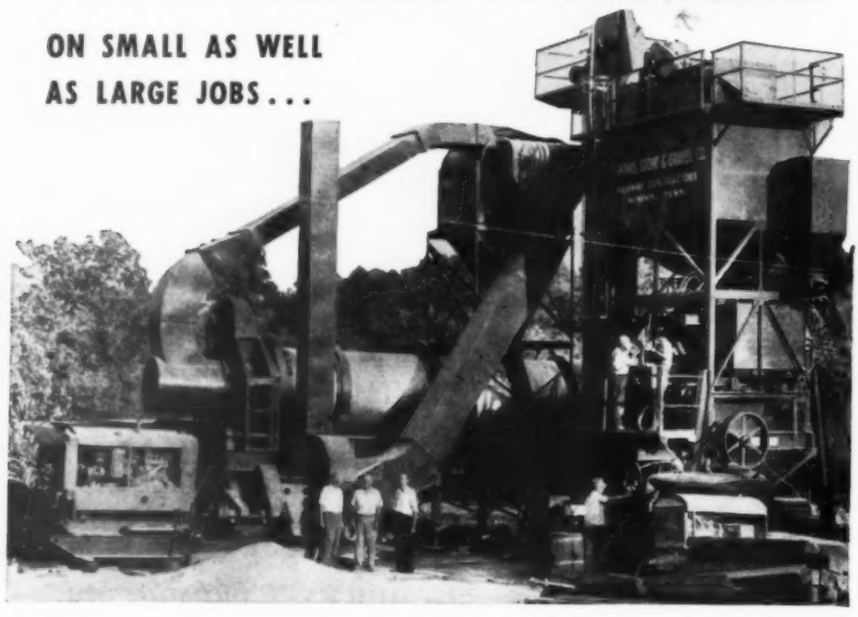
New Johnson Concrete Bucket

Hardfacing Alloys 312

A complete new line of hardfacing alloys has been announced by Air Reduction Sales Co., 60 E. 42nd St., New York 17, N.Y. Divided into three primary groups, ferrous alloys, cobalt base alloys and tungsten carbide, there are a total of 15 Airco hardfacing alloys available. In order to stimulate the introduction of this latest member of the Airco welding family, the manufacturer is making a special offer of a trial assortment of alloys. The assortment consists of: The new Aircolite hardfacing alloy for equipment subjected to severe abrasion and medium impact such as pulverizer hammers and core crusher rolls (for oxy-acetylene and electric arc application).

For Efficient Production

ON SMALL AS WELL AS LARGE JOBS...



H&B Model PA Portable Asphalt Plants

Shown above is the Hetherington & Berner PA-30 hot mix plant recently delivered to Memphis Stone & Gravel Co., Highway Contractors, Memphis, Tenn. These PA plants are designed to give efficient production on small as well as large jobs—under a wide variety of operating conditions.

PA plants may be driven with individual motors or from one main power unit for the tower and one for the dryer, using gasoline, diesel, diesel electric or electric power. They are easily portable by truck. Low overall height is maintained by using a flat screen, and can be further reduced by use of a depressed driveway. Write for Bulletin P-46.

MOTO-PAVER

The complete mixing and paving machine for mixed-in-place work. Write for Bulletin MP-47.

HETHERINGTON & BERNER INC.

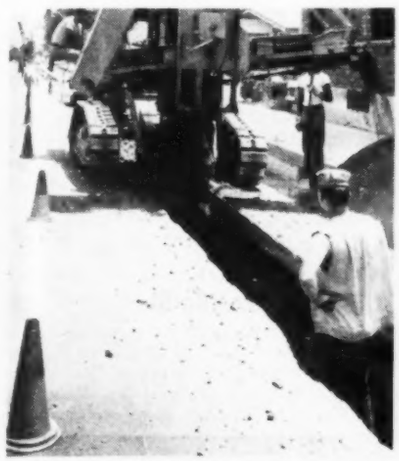
721 Kentucky Avenue, Indianapolis 7, Indiana

H&B Builds Portable and Stationary Asphalt Plants of All Types, Sizes and Capacities

The new Airco self-hardening alloy for equipment subjected to severe impact and abrasion such as bucket teeth and sizing screens (electric arc). This trial assortment is being made available at the special price of $2.95. According to Airco, the assortment contains a sufficient quantity to assure an adequate performance test.

Traffic Controls 313

A cone made of collapsible rubber is being introduced by Enterprise Development Corp., Burbank, Calif., as a means for controlling traffic. One of the most outstanding features claimed for this

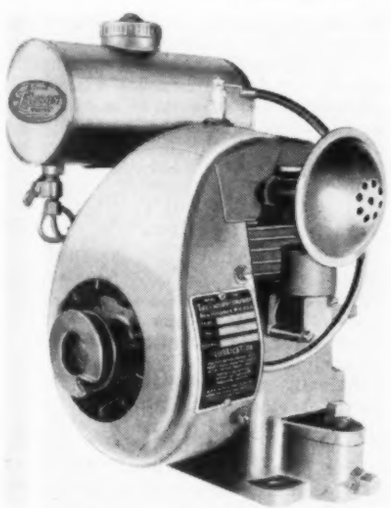


Installation of Rubber Trafficone

cone is its durable, flexible construction which means infrequent replacement because of breakage, distortion or wear. The lightweight construction of these rubber cones makes them easy for a man to handle. Stacking each cone adds only 1 in. and many hundreds of them can be stored in a minimum of space.

Lightweight Gasoline Engine 314

A new ¾ h.p. gasoline engine developed by Lauson Co., New Holstein, Wis. weighs only 23 lbs. Important features include ball bearings on the crank-



Model LMC Gasoline Engine

shaft, float feed, automotive-type carburetor, fly ball governor and high tension magneto. The new engine has a bore of 1⅝ in. and a stroke of 1½ in., with a piston displacement of 3.11 cu. in.

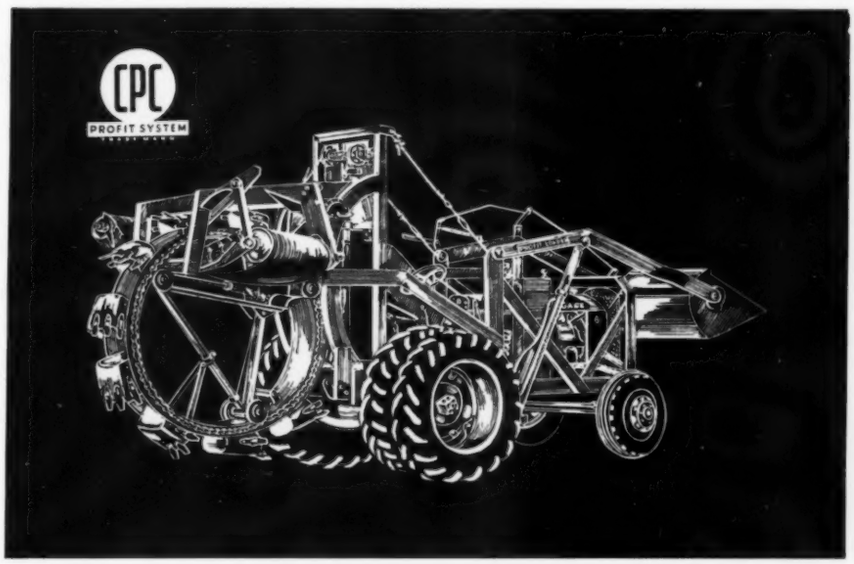
MANUFACTURERS' LITERATURE

V-Belt Drives 315

A 100-page manual, to assist engineers in designing both multiple and light-duty V-belt drives, has been published by the mechanical goods division, United States Rubber Co., Rockefeller Center, New York 20, N. Y. The manual contains a comprehensive set of drive tables for multiple belts, complete sheave data including construction, dimensions, and weights; complete fractional horsepower drive layouts; comparison tables with information on quarter-turn drives and hexagon double V-drives. Detailed information on U. S. Royal super-service V-belt, U. S. Rainbow steel cord belts, standard U. S. Rainbow V-belts with equa-tensil cord section is also contained in the manual.

Road Machine 316

The "Expert Workman," a new road machine that grades, ditches, maintains and rakes, is illustrated and described in a catalog issued by York Modern Corporation, Unadilla, N. Y. The machine has a 360 lb. scarifier head carrying 10 teeth that cut a path 5 ft. wide, a cast steel grader-type circle with high carbon moldboard, and an adjustable rake with 59 heat-treated alloy steel teeth.



CUT COSTS! TRENCH AND LOAD WITH PROFIT SYSTEM TOOLS ON CASE TRACTORS

PROFIT SYSTEM "VAI" COMPANION TOOLS INCLUDE:

PROFIT LOADER
PROFIT TRENCHER
ANGLE DOZER
PROFIT SCOOP
ANGLE GRADER
FORK LIFT
FRONT LIFT HOOK
EARTH AUGER
REAR LIFT HOOK
AIR COMPRESSOR
REAR MOUNTED WINCH
CRANE ATTACHMENT

See your CPC-Case dealer or write direct for further details.

Here is the *only* rig which digs a trench, backfills it, then loads the surplus dirt. It's spectacular . . . in a class by itself!

The PROFIT TRENCHER does a *real* job, too. Trenches from 12" to 18" in width, up to 52" deep. Has 20 different digging combinations, swift transport speeds which save time between jobs. Rubber tires are also gentle on lawns, golf courses, parks.

Complete combination of PROFIT TRENCHER, PROFIT LOADER and Case "VAI" costs far less than a competitive trencher *alone*. And there are many other PROFIT SYSTEM advantages. Ask your CPC-Case dealer for further details.

Free!

CONSTRUCTION PRODUCTS CORPORATION, DEPT R.S.
4345 E. Imperial Highway, Lynwood, California

Gentlemen:

Yes, I am interested in more information about your Profit System for the Case "VAI" tractor. Please send me your free Bulletin 121!

NAME.....

ADDRESS.....

CITY..... ZONE..... STATE.....

OCCUPATION.....

Locomotive Crane 317

A new catalog devoted to its 25-ton diesel locomotive crane, now available from the American Hoist & Derrick Co., St. Paul 1, Minn., illustrates the crane in action in magnet, bucket, hook and pulpwood work. Many photographs of the important mechanical features are also included.

Washing Plant 318

The completely redesigned 305-W washing plant for sand, gravel and crushed aggregates, manufactured by Pioneer Engineering Works, Minneapolis 13, Minn., is described in an 8-page folder, profusely illustrated, with a full 2-page cut-away drawing in two colors. The 305-W washing plant scrubs, cleans and washes 50 to 75 yd. of aggregate per hour. It has a revolving scrubber drum and revolving screen capable of separating three sizes of stone and sand and depositing them in bins under the plant for truck loading. A drag type dehydrator delivers sand to one compartment of the bins. When desired a second dehydrator can be used to provide an additional grade of sand. A reciprocating plate feeder at the end of a 70 ft. conveyor loads the plant.

Tractor Shovel 319

A catalog on its new 4-wheel-drive Model HM Payloade just issued by The Frank G. Hough Co., 804 T Sunnyside Ave., Libertyville, Ill., contains complete specifications on this 1½ cu. yd. tractor shovel and numerous action views from a variety of jobs. Many outstanding and unusual features and advantages claimed for this tractor-shovel are also illustrated—hydraulic bucket control, several speeds in either direction, fast forward-reverse control, power boosted steering, controlled dumping, operator visibility, ground-gripping traction provided by large earth mover tires and four-wheel drive.

Testing Lubricating Oil 320

A new circular, No. 300, "Required Equipment for Lubrication Control," issued by The Gerin Corporation, Red Bank, N. J., illustrates the portable oil inspection kit recently announced by the company whereby any mechanic can quickly measure the contaminants occuring in lubricating oil during use. Simplified yet accurate methods are explained for measuring asphaltic and other deposit forming contaminants; dirt, metal particles, other sediment and water; acidity showing whether corrosion is possible and changes in viscosity due to fuel dilution and other causes. All four tests are said to be completed in 25 minutes for four samples of oil.

Vibrating Screen 321

The screen-all positive eccentric vibrating screen is featured in a new bulletin No. 1,200 issue by Lippmann Engineering Works, 4603 W. Mitchell St., Milwaukee 14, Wis. The 16-page, 2-color book gives specifications and dimensions for 69 sizes of single-, double- and triple-deck units. Chief features of the new design are the hub-mounted bearings which are located outside the screen body, straight shaft design with eccentricity achieved by means of patented hubs, three-point suspension or support.

Motor Grader 322

A new catalog on its 100 h.p. motor grader, the No. 610, has been released by J. D. Adams Manufacturing Co., Indianapolis, Ind. The No. 610 is powered by a 100 h.p. UD-16 International Diesel engine and weighs from 25,200 to 27,000 lb. depending on equipment. With over 18,000 lb. on the rear wheels ample traction is provided to take full advantage of the 100 h.p. engine. Outstanding feature of the No. 610 include: combination mechanical-hydraulic steering, full-floating rear axle, 8 forward speeds with a high transport speed of over 25 m.p.h., 14:00-24 rear tires on tandem, 12 ft. blade 28 in. wide and new, improved, faster mechanically-operated controls.

Feeders 323

A new 8-page bulletin describing Cedarapids apron-type and reciprocating type feeders, published by Iowa Manufacturing Co., Cedar Rapids, Ia., gives detailed descriptions and specifications on the complete line of Cedarapids feeders, graphically showing their operation and use in typical installation photos and diagrams. Feeders for use with all types of material handling and bituminous mixing plants are included. Among the units are apron type feeders for use with crushers, or under bins to feed on to a conveyor—in a range of sizes to handle any size feed, including big rock. For use with bituminous mixing plants, there are apron type feeders which control the proportions of aggregates and assure steady operation of the entire plant. Also described in detail are: A ground

Dig Deep FAST! WITH AN OSGOOD

Get MORE Yardage . . . Even In Tight-Fit, Hard-To-Get-At Corners

Move an agile Osgood hoe right up to the job—and into it—with no lost motion. Its reputation is built on superior speed, mobility, power, and a high and far reach that allows the operator to pick up a load anywhere and to drop it accurately—wherever he wants it.

Yes, whatever the job, you can move more dirt, faster, with an Osgood—Shovel, Dragline, Crane, Clamshell, or Hoe. Gasoline, Diesel or Electric powered—⅜ to 2½ cu. yds. Write for descriptive literature and specifications.

POWER SHOVELS • CRANES • DRAGLINES • CLAMSHELLS • BACKHOES • PILE DRIVERS

THE OSGOOD CO. O-G THE GENERAL CO.
EXCAVATOR
MARION OHIO

DIESEL, GASOLINE OR ELECTRIC POWERED • ⅜ TO 2½ CU. YD. • CRAWLERS & MOBILCRANES

level heavy duty apron type feeder for use where raw material is handled by truck, dumptor or scraper. Loading traps designed to handle direct dumping from trucks, scrapers, bulldozers, shovels or draglines. Reciprocating type feeders in a wide selection of sizes are described.

4-Fuel Carbureted Engines 324

Industrial engines and equipment for their operation on gasoline, kerosene, distillate or natural gas in a wide variety of applications, are described and shown by International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., in a new 12-page catalog covering 4 carburetor-type engines. Models presented are available as stripped engines or with job-determined equipment combinations up to complete power unit. Maximum working horsepower ratings range from 24 to 55 for power units complete with fan, radiator, air cleaner, governor, when operating on gasoline.

Compressor Selection Chart 325

A new selection chart, based on normal applications handling air with atmospheric intake pressure is available from Worthington Pump and Machinery Corporation, Harrison, N. J. The chart simplifies selection of proper size compressor for average industrial use, with quick comparison between discharge pressure pounds per square inch gauge, and piston displacement cubic feet per minute, and shows recommended compressor bore and stroke in inches. Copy of the chart may be had upon written request on letterhead addressed to Worshington Pump and Machinery Corporation, Publications Dept., Harrison, N. J.

Batching Plants 326

Three types of Heltzel batching plants are described in Bulletin J-37 of The Heltzel Steel Form & Iron Co., Warren, O. Included in this publication are all recent improvements in their central mix, transit mix and concrete products plants and accessory equipment. Data, specifications and illustrations are arranged for easy interpretation and to present useful ideas to operators. The plants described range in capacity from 100 to 400 tons and in most cases are combination plants with both aggregate and cement compartments.

WITH THE MANUFACTURERS & DISTRIBUTORS

Syntron Changes

Syntron Co., Homer City, Pa., manufacturers of vibratory material handling equipment and power tools, has appointed George L. Chedsey as supervisor of mining equipment. He will work out of the Company's Main Office, directing the engineering design and application of Syntron dewatering screens, vibratory feeders, conveyors, and grizzlies to the mining industry. E. J. McIlvaine has been appointed as a junior salesman in the vibratory material handling division of the St. Louis Office. John C. Mitchell will take over power tool sales in the Boston, Mass. Office. A. C. Staley, Jr. has been appointed as a junior salesman in the vibratory material handling division in the Cleveland Office. F. J. Kirby, Jr. will handle power tool sales in the Cleveland, O., office. The Philadelphia branch sales office has been moved from its former location on Spring Garden St., to larger, more centrally located quarters at 1018-20 West Lehigh Ave., Philadelphia 33, Pa. The Kansas City, Mo. office has been moved and is now located in the Wirthman Bldg., 31st at Troost Ave.

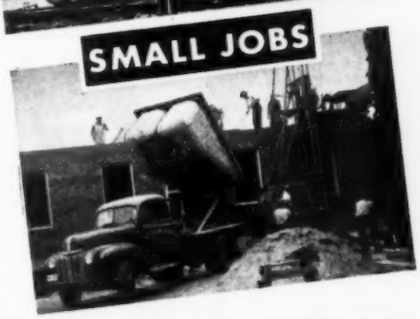
New Davey Distributor

J. P. Waite, Inc., 3304 West Pierce St., Milwaukee, Wis., has been appointed to a full line dealership by Davey Compressor Co., Kent, O. The new dealer will handle all items of Davey Manufacture.

New Bucyrus-Erie Distributor

State Equipment Co., Harrisburg and Kingston, Pa., has been appointed distributors for excavators and hydrocranes of the Bucyrus-Erie Co., South Milwaukee, Wis. They will handle this well-known line of ⅜- to 2½-yard shovels, draglines, and cranes and the new all-hydraulic truck cranes in east-central Pennsylvania. State Equipment also handles all Bucyrus-Erie tractor equipment—bullgraders, bulldozers, dozer-shovels, and scrapers. Furnival Machinery Co., Philadelphia, will continue as excavator and hydrocrane distributors for south-eastern Pennsylvania. In the western counties of the state, Bucyrus-Erie excavator sales will, as before, be handled by Beckwith Machinery Co. of Pittsburgh and Bradford. The western Pennsylvania hydrocrane distributor is Dravo-Doyle Co. of Pittsburgh.

Over 1,500,000 YDS. of CONCRETE DELIVERED BY DUMPCRETE IN 1948



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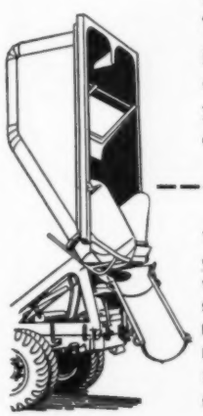

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The first of a Series in the interest of more efficient use of steel, a vital American resource

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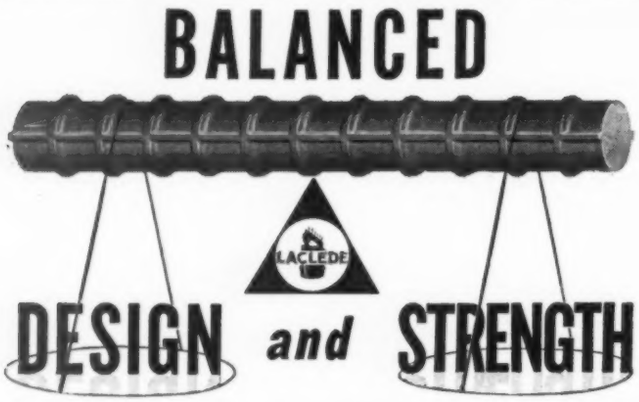

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HIGH STRENGTH for STEEL—CONCRETE SAVINGS

"30 years ahead of the building codes" —that's the verdict on the Laclede Multi-Rib Reinforcing Bar. All tests show that the long sought balance between high strength and adequate anchorage has been achieved. The combined factors of high yield point (in excess of 55,000 PSI) plus improved deformations give greater reinforcement strength and provide a more efficient use of steel . . . conserving America's most important resource while effecting material savings on the job. Laclede bars meet ASTM Specifications A305-47T, for improved reinforcing bars, developed in the interest of modern, efficient use of steel.

Write us about specifying Laclede Multi-Rib bars on your jobs.

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Producers of Construction Steel

LACLEDE STEEL COMPANY
St. Louis, Mo.

DOES IT WITH A ROGERS

ECK MILLER
OF OWENSBORO, KENTUCKY

using a Rogers Model D-35-D and a Rogers Pole Type Trailer loaded with 80,000 lbs. of steel tank 67 feet in length. The conventional trailer mounts a fifth-wheel type of bolster which supports the front of the load and tows the pole trailer which carries the rear of the load.

DOES IT WITH A ROGERS

A. B. BURTON CO., Inc.
OF LYNCHBURG, VA.

Moving this heavy Northwest power shovel from job to job presents no problem to the A. B. Burton Co. when they have their D-50-D Rogers semi-trailer to rely upon.

and* YOU CAN DO IT WITH A *ROGERS trailer, whether the jobs involved require the hauling of light, medium or heavy equipment. Why not learn in detail just what Rogers has to offer? Write TODAY for your copy of the NEW CATALOG.

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ROGERS BROTHERS CORPORATION
DESIGNERS and BUILDERS of HEAVY DUTY TRAILERS
SINCE 1915
110 Orchard St., Albion, Penna.

McGraw Joins Riddell

A. W. McGraw

Newest addition to the road machinery sales staff of the W. A. Riddell Corp., Bucyrus, O., is A. William (Bill) McGraw, who will serve in the capacity of sales promotion manager for Warco motor graders and Hercules road rollers. Following his graduation from Ohio University engineering school, Bill served for three years in the armed forces as a pilot in the Navy Air Force. After the war, he became associated with one of the nation's larger construction machinery manufacturers, serving as a district representative in the St. Louis area.

Larkin Elected President

David Larkin

At the recent annual meeting of the Wire Rope Institute, David Larkin was elected president of the organization for a one-year term. He succeeds E. C. Low, of John A. Roebling's Sons Co., who became chairman of the board. Larkin, executive vice president of the Broderick and Bascom Rope Co., is a graduate of the University of Edinburgh, Scotland. He is widely known in the wire rope industry, with which he has been actively identified for 21 years. He is chairman of the advisory board, Washington University School of Engineering, St. Louis, Mo., and a fellow of the American Society of Mechanical Engineers. In addition to Larkin and Low, other new officers of the institute are: vice president, H. C. Parker, of Bergen Wire Rope Co.; secretary, W. A. Huber, of American Chain and Cable Co.; treasurer, D. W. Vernon, of A. Leschen and Sons Rope Co.

Bower Promoted by Waukesha

L. L. Bower

Lloyd L. Bower has been appointed chief engineer of Waukesha Motor Co., Waukesha, Wis., succeeding James B. Fisher, who retired on Jan. 31, after 35 years of active duty. Mr. Bower has been active in the company's engineering department more than twenty years, and as Fisher's assistant for half that time.

Appointed Research Head

Dr. G. V. Slottman has been appointed director of research and engineering for Air Reduction Co., 60 E. 42nd St., New York, N. Y. Dr. Slottman, who joined Air Reduction in 1934, served as manager, technical sales division and, on Jan. 1st, 1948 was appointed technical assistant to the vice president in charge of sales, a position he held until his recent appointment.

Timken Changes

T. F. Rose, Cincinnati branch manager of The Timken Roller Bearing Company's Service Sales Division, has become manager of Timken Roller Bearing Service and Sales Limited, Toronto, Ont., Canadian subsidiary of the Canton, O., company. Announcement of the transfer follows the death, recently, of C. E. Webster, manager of the Timken Canadian subsidiary since 1930. H. C. Telford, assistant manager of the Timken branch in Atlanta, Ga., becomes the new Cincinnati manager. Rose, a native of Canton, O., joined the Timken organization in July, 1924, becoming a sales representative in the Chicago office of the company. In April, 1926, he went to Cincinnati, where in 1934 he was transferred to become manager of the Timken Pittsburgh office. In January, 1946, he again became manager of the Cincinnati branch. Telford joined the Atlanta staff of the Timken Roller Bearing Co. in January, 1928, becoming a sales representative in January, 1936.

Goodrich Promotions

Everett C. "Pete" Shingleton has been named assistant product manager for automotive, industrial and farm services tire sales in the Automotive, Aviation and Government Division of The B. F. Goodrich Co. He succeeds Delmar C. Homer, who has been transferred to the division's New York district. Shingleton, who has been in the sales promotion department of the Replacement Tire Sales Division since his return from service with the armed forces, has been with the company since 1937, and in advertising and sales promotion since 1938. I. N. Kimsey has been named field sales manager of the Industrial Products Sales department. Mr. Kimsey had been manager of the Akron district for industrial products sales for the last 10 years. He joined the company as an industrial products salesman in 1922. Kimsey's former post is taken by John M. Cooney, who was manager of the Boston district for industrial product sales for the last 2 years.

Haiss Appoints

D. G. Caywood, Jr.

W. E. Madden, vice president, George Haiss Manufacturing Co., Inc., New York, N. Y., division of Pettibone Mulliken Corporation, has announced the appointment of Dan G. Caywood, Jr., 272 Highland Ave., Newton, Mass., as its exclusive representative on conveyors and coal loaders in part of the state of Massachusetts and all of the states of Maine and New Hampshire. Mr. Caywood has had more than 20 years' experience in sale and service of material handling equipment.

Tractomotive Corp. Moves

The Tractomotive Corporation formerly of Findlay, O., has moved to its new plant at Deerfield, Ill. Tractomotive manufactures front-end shovels and loaders for Allis-Chalmers crawler and wheel type tractors in addition to other road building equipment. All products are sold exclusively through Allis-Chalmers industrial dealers.

Rubin Becomes Sales Manager

A. S. Rubin, Jr.

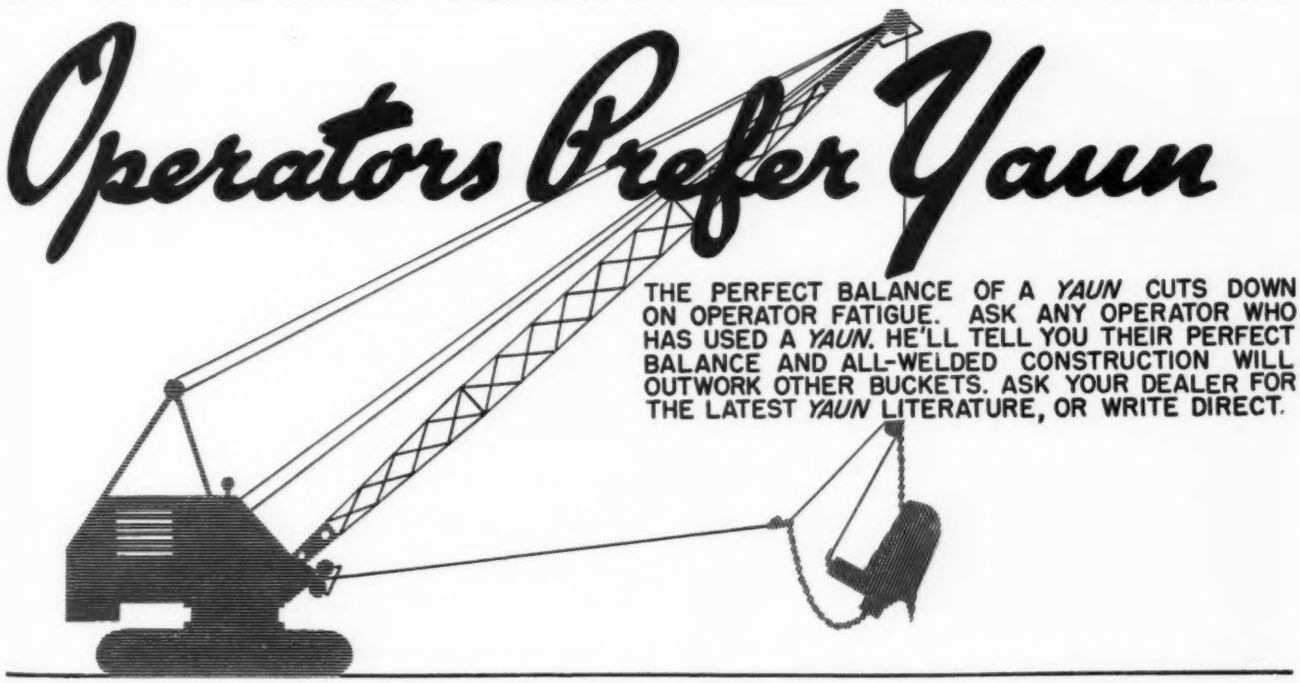
Andre S. Rubin, Jr., has been appointed sales manager for Marlow Pumps, Ridgewood, N. J. In this capacity, Mr. Rubin will actively direct sales and sales promotion for the line of construction pumps manufactured by this company. Mr. Rubin has been affiliated with Marlow Pumps since 1942 when he became assistant to the late A. S. Marlow, Sr., founder of the organization. Active since that time in the development of the Marlow line of self-priming centrifugal pumps for construction, Mr. Rubin is widely known in the construction industry.

Hanse Named District Sales Manager

Lyle T. Hanse has been named a district sales manager of the New Holland Manufacturing Co., Mountville, Penn. He is in charge of the sale of New Holland pit and quarry equipment in North and South Dakota, Nebraska, Wisconsin, Upper Michigan, Minnesota, Iowa, Illinois, Missouri, Kansas and Indiana.

New Gar Wood Distributor

Whitco Truck Equipment Co., 930 Mason St., Louisville, Ky., has been appointed distributor for Gar Wood Industries, Inc., Wayne, Mich. They will handle Gar Wood hydraulic hoists, dump bodies, winches, cranes, truck tanks and load-packer refuse collection units.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THE PERFECT BALANCE OF A YAUN CUTS DOWN ON OPERATOR FATIGUE. ASK ANY OPERATOR WHO HAS USED A YAUN. HE'LL TELL YOU THEIR PERFECT BALANCE AND ALL-WELDED CONSTRUCTION WILL OUTWORK OTHER BUCKETS. ASK YOUR DEALER FOR THE LATEST YAUN LITERATURE, OR WRITE DIRECT.
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DRAGLINE BUCKETS AND MFG. PLANT
BATON ROUGE, LA.

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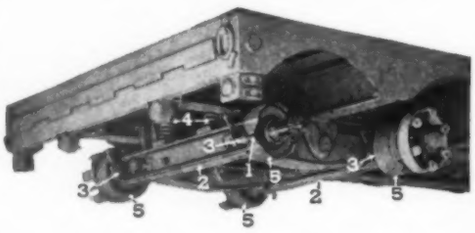
Deep, wide flange main beams running the full length of the trailer, I-Beam sections for cross-members and outriggers, improved, fabricated gooseneck, and *all* electric-welded construction. Look at all the other features found only on Jahn tandem axles: (1) constant lift cam, (2) two full-width axles attached to longitudinal rocker beams, (3) worm gear type slack adjusters at each wheel, (4) heavy coil springs at each axle and (5) positive equalizing braking at each wheel regardless of position of axle.



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Heavy duty trailers from 5 to 100 tons.

JAHN TRAILERS ALL OVER the WORLD!

Allis-Chalmers Appointment

R. F. Garity

R. F. Garity has just been appointed Eastern industrial territory manager of the Allis-Chalmers Tractor Division, Milwaukee, Wis. Garity joined the Allis-Chalmers organization in 1942 as an expediter and was appointed industrial sales manager of the company's Omaha branch in 1944. Two years later he became industrial district manager for the company's Minnesota territory. Garity will have his headquarters at the company's Milwaukee home office.

Appointed District Representative

F. W. Vigneault, Jr.

Francis W. Vigneault, Jr. has been named district representative for tractor equipment in the northeastern territory for the Hyster Co., of Peoria and Danville, Ill. and Portland, Ore. Since 1940, except for three years of military service, Mr. Vigneault has been connected with the Caterpillar Tractor Co. and has had experience in factory work as well as sales training and sales development.

SKF Appointments

Appointment of Stuart H. Smith as Cincinnati district manager of SKF Industries, Inc., and changes in personnel of other district offices of the ball and roller bearing firm have been announced by R. R. Zisette, general sales manager. Smith, who joined SKF in 1934, has been assistant district manager of the Detroit office since 1944. Named field representatives were: C. N. Benson and D. B. Eden, Boston; A. R. Ehrnschwender, Cincinnati; J. T. Paradise, Atlanta, and G. L. Hansen, Portland, Ore. Benson joined SKF in 1916 and was supervising engineer of the paper-mill division for many years. Eden was formerly quality-control supervisor. Ehrnschwender, Paradise and Hansen joined the firm in 1948 as engineer trainees.

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★ 1000 rooms with bath

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Goodrich Off-the-Road Tires
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Barnett Gets Wellington Award

Joseph Barnett, chief of the urban roads division of the Public Roads Administration, has been awarded the Arthur M. Wellington Prize by the

American Society of Civil Engineers for a paper entitled "Express Highway Planning in Metropolitan Areas."

The prize is presented each year to the author of the most outstanding paper published by the Society on a subject of interest to civil engineers.

Rotterdam Soils Conference Proceedings Available

Information has been received from T. K. Huizinga, Secretary of the 2nd International Conference on Soil Mechanics and Foundation Engineering, that a few sets of the proceedings for that meeting are still available. A seventh volume in addition to the six volumes already published, will be printed if sufficient orders are received to justify it. Price of the original six is 75 guilders or about $30. Orders for the seventh volume at 15 guilders are being taken.

Anyone interested should write to Mr. T. K. Huizinga, Director, Laboratory of Soil Mechanics, Oostplantsoen 25, Delft, Netherlands.

American Road Builders' Meeting

(*Continued from page* 53)

of Barber-Green Co., Aurora, Ill. Vice-Presidents: H. W. Richardson, Construction Methods, New York; 2nd v.p.: W. E. Miles, general manager, Oliver Corporation, Cleveland, O.; secy.-treas.: E. F. Armington, vice-president, Euclid Road Machinery Co., Cleveland, Ohio.

also be held accountable for the inevitable tremendous damages to roadbeds. The PRA Commissioner recommended holding firmly to the 18,000-lb. axle limit and other provisions of the Uniform Motor Vehicle Code now adopted in many states and being considered in others.

The chief destructive factor on our roads, he went on, is that of over-

Sauerman Power Scraper operating a 3 cu. yd. Crescent bucket on a 700-ft. span, digs and hauls gravel from deep pit, feeding material to plant at rate of 60 tons per hour.

This Sauerman Slackline Cableway lifts gravel from river to car-loading hopper on bank; loads twelve cars a day.

Handle Material Faster, Cheaper

with a

SAUERMAN MACHINE

Digging, hauling and dumping are combined in one continuous operation when you use a Sauerman Cableway or Power Scraper. Your equipment investment is less and you save on time and labor.

A Sauerman machine can be installed to reach across a pit, pond, river or stockpile or up to the top of a hill and will move material at high speed from one point to another anywhere within its wide radius of operation.

Sauerman machines are backed by 40 years of specialized experience in designing this type of equipment. Whether it is an installation to handle a hundred tons or many thousand tons per day, it will be efficient and economical and easily operated by one man.

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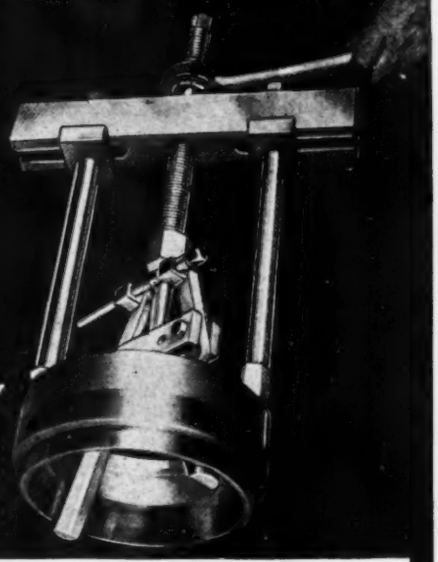

Bearings, pinions, collars, sprockets, gears, pulleys, sheaves, shafts, sleeves, wheels and other "tuffies" are quickly and safely removed and installed with OTC PULLERS, attachments and Special Tools. They speed up maintenance and repair jobs, avoid parts damage, shorten "down time". Approved by all Leading Bearing Manufacturers.

Write for Industrial Maintenance Bulletin No. PE-1946

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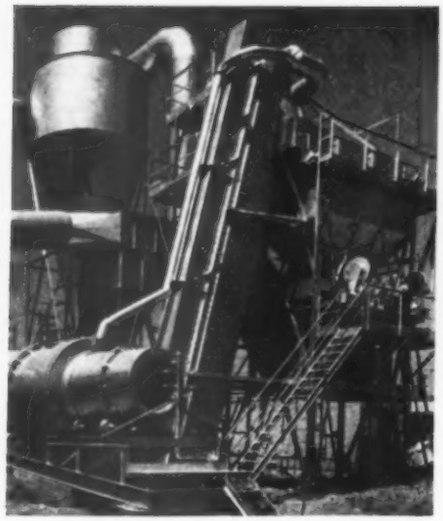

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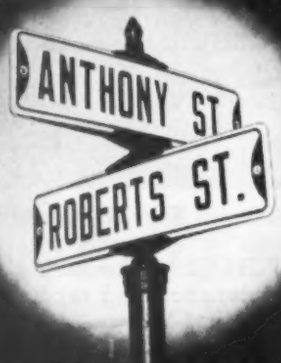

WRITE FOR CATALOG
CATAPHOTE CORPORATION
TOLEDO, OHIO

★ Prof. A. Diefendorf of the University of Utah (left) president of the Educational Division of American Road Builders' Association, presents charter for the recently organized Enoch R. Needles Student Chapter of ARBA at the University of Missouri to Prof. Joe B. Butler, Missouri School of Mines, Rolla, Mo.

loading far beyond the legal limits. It is a false assumption that highways are expendible. We simply cannot afford to expend our highway system faster than the rate of deterioration normal for adequately designed structures. Nor can axle load limits be raised gradually, as some advocate, without always subjecting large mileages to destructive forces.

Commissioner MacDonald refuted some of the statements made by truck groups, one being the claim that "climate and subgrade conditions are the chief cause of highway deterioration." This might have been true 20 years ago, but not today. Truck transportation in the U.S. has grown from an estimated 11½ billion annual truck-miles in 1931 to 34 billion today. More serious is the rise in the incidence of heavier loads. In 1931, only 8 trucks in each 1,000 had axle loads of 18,000 lb. Today this figure is 76 per 1,000, with 33 loads exceeding 20,000 lb. In individual states loads range far higher. As a result, all high-type pavements are suffering damage that runs into staggering sums in replacement or repair cost. Asphaltic concrete pavements become wavy or raveled, and concrete pavements develop pumping, even with subgrade soils that formerly were considered safe against pumping troubles.

All research points to the fact the pavement damage on high-type roads is confined to results of overload repetition. An example of the repetition suffered by some pavements is that for a certain typical New Jersey arterial, where a check revealed 1,600 loads daily exceeding 16,000 lb. axle loads with some axle loads up to 28,000 lb. Older highway designs are not adequate under these new conditions, and once a pavement is broken or distorted by one overload, all heavy loads there-

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EMBURY MFG. CO., WARSAW, N. Y.

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BLADES AND CUTTING EDGES

For any make of machine
Motor Graders, Maintainers, Scrapers, Drags, Bulldozers, Backfillers, Wagon Scrapers, Trail Builders, Trail Blazers, Carryalls. Also—

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EXTENSION BLADES
MOLDBOARDS
and
SCARIFIER TEETH

50 years of manufacturing blades has developed for you a special steel, milled through our own rolls and forged at the edges to give that extra wearing quality you need.

All widths lengths, and thicknesses. Punched ready to fit your machine.

Consult your internationally recognized Blade Specialists. Write for special bulletins, giving type and name of machines you operate—get set for Blades early.

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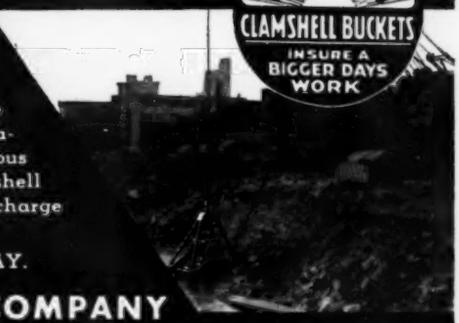

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after become destructive forces, said Mr. MacDonald.

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ARBA to Expand

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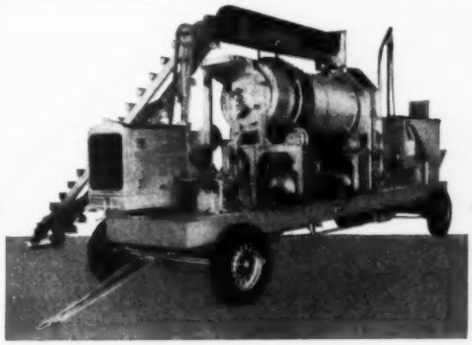

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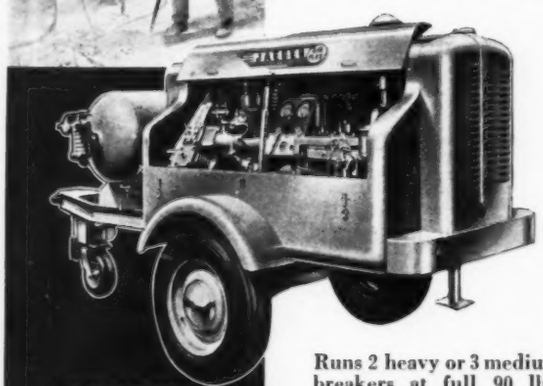

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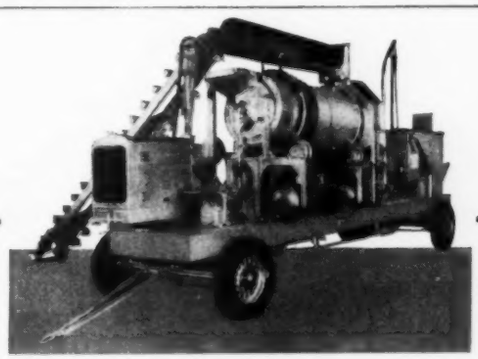

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that we are "20 years and 15 billion dollars behind the motor vehicle in roadbuilding," and urged that the findings of a survey of ARBA made recently by the management firm of Booz, Allen & Hamilton be studied and its recommendations followed, with a view of expanding ARBA's scope and operation methods.

Further utterances were made on ARBA's future by incoming President Needles, who credited the Association with a leadership part in highway development and particularly cited Mr. Upham's "vision, personality and leadership" as a factor in the Association's achievements. The Association has presently under consideration a program of headquarters expansion, including the appointment of one salaried assistant to concentrate on technical activities and one to expand public relations and contacts with other organizations, The ARBA education division is also slated for expansion, explained Col. Needles. As a step toward selling highway engineering as a career to students it is suggested that a team of four visiting lecturers—a public official, an engineer, a contractor and a manufacturer representative—tour the engineering schools telling a carefully planned story with sound films and other dramatic aids.

Compaction Committee Notes

The ARBA committee on soils compaction held a well-attended meeting, with Earl F. Bennett of Koppers Co. (formerly N.Y. dept of p.w.) presiding as chairman. Mr. Bennett prefaced the program by noting that variations in the fine silt and clap fraction constitute the controlling factor in soil compaction. Subgrades should be properly compacted and also the materials in the pavement.

Among the activities sponsored by the committee in the past year was the notable series of papers given at the Road Show meeting last summer. The committee also sponsored a test project for studying the effectiveness of heavy pneumatic rollers in sandy soils. As outlined by A. O. Williamson of Wm. Bros Mfg. Co., which supplied the roller, the unit used consisted of a single-axle pneumatic-tired roller still in the experimental stage of manufacture. The machine is designed in two articulating sections (as with the Porter roller), with two independent wheel assemblies oscillating to allow traversing of uneven ground. The unit weighs 24,000 lb. empty, 100,000 lb. when completely filled with damp sand. Designed primarily for highway work this unit can be towed by a tractor of the Caterpillar D7 or D8 class or a rubber-tired prime mover from a heavy scraper or earth wagon.

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Test details were presented by Mr. Cinicori of the Babylon division, New York department of public works, which cooperated in tests on a sandy section of secondary road on Long Island. Soil encountered contained less than 5% of minus-200-mesh material. Layers varied from 6 to 24 in. The roller was employed with 12 tons, 28 tons and 44 tons gross weight. Compaction requirements were specified at 90% AASHO, with 95% under roadway for top 4 ft. of embankment depth. Material compacted to 112-114 lb. dry weight at 12%-15% range of optimum. Soil ran 3% to 5% moisture before sprinkling, tests being made on soils of varying percentages of moisture up to optimum.

On a typical section two passes of the heavy roller secured 93% density in a 6-in. layer, 93% to 95% in the bottom of a 12-in. layer, 97% in the bottom of an 18-in. layer, and 99%

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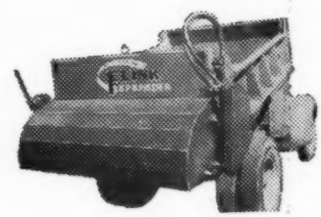

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in the bottom of a 24-in. layer. Passes were staggered in order to give uniform tire coverage. The greater compaction at lower depths was credited to the passage of heavy construction equipment, which traffic, however, was kept to a minimum wherever possible for purposes of testing roller results. Compaction always increased with depth, and always with each passage of the roller.

As many as five passes were used in the tests, each pass continuing to result in higher density. A noticeable advantage of the unit was seen in connection with 24-in. layers, which made for troublesome going even for the scrapers but could be properly compacted to full depth by making only two passes with the heavy roller. The contractor on this job is said to have considered the machine to offer economy advantages.

In discussion one spokesman reported that the Porter super-compactor used at the Limestone airbase last summer was known to be successful there. Gravel was compacted to meet very severe density requirements in two passes for 6 in. depth layers. Proper densification of the top lift could be secured in no other way.

Electrically powered vibratory equipment (Elector Tamper) designed to densify backfills behind abutments, etc., was mentioned during the discussion. Two New England road contractors were said to have employed such units recently with important savings, in order to meet rigid compaction requirements in situations (one contractor had actually considered going a lean concrete for backfill at his own expense as the cheapest way to pass inspection). The importance of proper layer placement and densification of backfills around structures was stressed.

An impact-type rammer (Barco) was also described as being effective in compacting certain glacial tills and other soils where vibratory equipment hasn't been satisfactory.

And in closing a good word was added for the familiar 12-15 ton flat steel wheel roller for compacting material of high stone content, and for the familiar smaller pneumatic roller for many soils and for topping out.

Flagging Bad Soils

Mr. Bennett related experiences on recent New York highway projects where extremely bad soils were encountered. He stressed the importance of "flagging" bad soil areas on plan sheets, so that contractors can be fully warned, and of putting a special inspection watch on cuts known in advance to involve poor soils or drainage. Most excavation gives no trouble. It is the small percentage of bad spots to watch, where normal field procedures cannot be used and where field changes are to be expected.

In fairness to the contractor, plans should indicate whether an unsatisfactory soil must be wasted, or whether it can be utilized in alternate layers with better material, as is sometimes feasible.

In New York it is sometimes considered expedient to utilize a poor soil for a fill, and to warn district maintenance men to expect probable high maintenance.

Another case where plan sheets should carry a clear warning to the bidder is where poor soils rule out heavy equipment during construction. An experienced contractor will usually spot such conditions, and pass up the job or bid and plan his equipment accordingly, but new contractors might run into trouble. The rule is not to allow a wheel load during construction that you wouldn't allow on the finished grade or pavement.

In most Eastern grading work excessive moisture is a continuing problem. Several speakers in discussion agreed that it doesn't pay to try to compact soils that are more than 2% or 3% above optimum, or over 3% to 5% above where high-speed tiller equipment is utilized for aerating. A test project is said to be planned in Ohio for 1949, to develop new data on methods and costs of drying soils with high-speed tillers at varying percentages above optimum.

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Roller, Huber 3-wheel, 10-ton
27-E Rex Paver, complete
Dragline Bucket, 1¼-yd, Page Model TS
4000-Gal Tank Semi-trailer, Trailmobile 90% new
Other surplus equipment, vibrators, light plants, concrete mixers, drill steel, asphalt sprayers, etc.
WANTED: 6", 7" and 8" Road forms.

TULLEY EQUIPMENT CO.

P. O. BOX 70
WEBSTER GROVES, 19, MISSOURI

NEW WHITE HALFTRACKS

Originally cost gov't $7,000. Now priced at such a very small fraction of that figure. With White 160AX motor, 4-speed trans. with auxiliary 2-speed shift and super power low speed drive. Hydraulic brakes, 900x20 tires. Excellent for logging, skidding, construction work, house moving, dump work. Available with or without winches. We carry a full line of replacement parts.

1,000,000's of G.I. Truck Parts.

Mail Orders Filled.

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For Sale—Immediate Shipment

New Light Rail 16-45 lb.

Relay Rail—85 & 90 lb.

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9—50 ton All Steel Cross Dump, Self Clearing. Suitable for Interchange. Attractive price.

NEW STEEL STORAGE TANKS

10,000 to 20,000 gal. Horizontals, Underwriter's Label.

Complete Stock Track Accessories.

W. H. DYER COMPANY, Inc.

1859-X Railway Exchange Bldg., St. Louis 1, Mo.

For Rent

SPEEDCRANES

LATE MODELS

Manitowoc Diesel Powered Speedcranes for rent. 25, 40 and 50 ton capacities with booms 100' or more, 20' and 30' jibs. Special price on long rentals.

FORSYTHE EQUIPMENT CO., INC.

11 West 42nd St. New York 18, N. Y.
Tel. PEnnsylvania 6-7554

Lima 1201 Dragline—3 yd.
Bu.Er 37B Comb. 1½ yd.
Marion Type 37 Elec. 1¾ yd.
Lima 503 1¼ Shovel and Drag.
Euclids end dump and bottom dump—Tournawagons—Super C tournapulls.

Steam cranes std. ga. Gas or diesel Loco—24, 36, 42 in. ga. Elec. Loco—St. Ga. 20 Ton. Dump Cars 55 Cu. Ft., 130 Cu. Ft., 16 cu ft. Ore Cars Std. Ga. 50 tons.

Rotary Kilns—Rod Mills—16"-30" Gyratory Crushers—30x18, 40x22 Roll Crushers—40G Slugger Hammermill—9x36, 10x24, 10x36, 14x24, 18x36, 20x36, 24x36, 30x42, 40x42, 42x60 Jaw Crushers some portable, some with feeders—Cone crushers 3 and 4 Ft.—Screens sgl. and double and triple dk. Feeders 3x10, 30x5—Door Classifiers—Cent. pumps—Deep well pumps—Tuggers—Mine hoists—75, 100, 150, 225 H.P.—Motors—Transformers—Conveyors—Portable Gravel Plants—Road rollers—Wagon Drills—Bu. Er. 29T and 42T Blast Hole Drills—Many other items.

STANLEY B. TROYER

Theatre Bldg. Crosby, Minnesota

"WANTED"

Crawler Base for Northwest, 80-D, complete New, or Used

"FOR SALE"

2—Shovel Fronts Complete for Manitowoc, Model 2000B — New, in crates

2—Shovel Fronts for Northwest Model "6" 1½ yard—New and used

2—Shovel Fronts for Northwest 80-D, 2½ yard, complete—New and used

12—Shovel Fronts for Northwest Model "25" ¾ yard—Unused, Complete

Contact: **KEN ROYCE INC.**
185 Bayshore Blvd.
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FOR SALE

1—4 cylinder Minneapolis-Moline gas engine Model ME 8" x 9". Excellent condition. (From Model 6 Northwest) Complete with radiator.....$500.00
1—6 cylinder Hercules diesel. New Model DFXE 5⅝ x 6" $1500.00

H. & L. EXCAVATIONS INC.

Grant Park Phone 3501 Illinois

---

1 Model 514 Unit crane, full crawlers
1 Model 30 Hanson crane, full crawlers
1 T-40 International bulldozer
1 R-5 Caterpillar bulldozer, LaPlante Choate Ingersoll-Rand Jack Bits $25 per hund.
1 Ingram stiff leg derrick with Case power unit
1 Hayward ¾ yd. fork or grapple bucket
1 Buffalo-Springfield three-wheel road roller 3½-5 tons
1 Ransome Dble Drum Paver
International Tractor with front end loader

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ROTARY DRYERS

NEW AND USED
ALL SIZES

P. R. PERKINS, SKOKIE, ILL.

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¾ yard Speeder shovel and 35' crane boom—Fairlends M.R.Z. Waukesha, Gas power, built 1938. Working every day—$4000.00.

Jack Rodeghier

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1—Lorain TL-20 Gas Crawler Backhoe, 30" bucket, new Aug. 1948.
1—Link-Belt 40 ton cap. K-55 Gas Crawler Crane, 90' Bm., rebuilt.
1—Lorain MC-414 Moto-Crane 1948.

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Tel. Ridgewood 6-2275

FOR SALE

DUMP TRUCKS

1942 Sterling — Model 144 — Chain drive, 5-Yd. Body. Perfect condition.

Mack—Model FN—Chain drive. Very low mileage. Was used by town. 5-Yd. Body with Hydraulic V-shape snow plow. Priced to sell. Several other big, cheap dump trucks. Also Bodies and Hoists.

3—1941 Model F.G. Chain Drive Mack Dump Trucks.

BULLDOZER

Allis-Chalmers—Model HD 14—Used about 2,000 Hours. A-1 Condition. Priced to be sold.

¾-YD. SHOVEL

Byers with Backhoe attachment. Model 83. Extra fine condition. Shows no wear.

10-WHEEL TRUCKS

4 GMC 804 Cab over engine. Will take 20 foot body or suitable for mounting cranes. Were used by oil companies. Exceptionally good condition. $1,000 each.

BIG TRACTORS

2—1943 available; 10 Wheeler, H.B. 600 Cummins Diesel, dual drive, 22 ft. platform with spool type winch, less than 1500 mi.

1946 Sterling Tractor—with HB 600 Cummins Diesel. Suitable for heavy hauling or low bed trailer work.

WARREN E. McCARTHY, INC.
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WANTED

1—Central mix plant for one cubic yard stationary mixer, consisting of aggregate and cement bins and batchers, cement track screw and elevator. Mixer not required. 75 to 100 tons aggregate storage and 300 to 600 barrels cement storage desired.

1—Standard gauge 8 to 12 ton gas locomotive.

LEWIS & BOWMAN, Inc.
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Two No. 9 Joltcretes—priced to sell.

Ten Clipper Strippers—$1500 each.

All guaranteed to be in first class condition.

Thousands of steel and cast-iron, cored pallets.

Universal Concrete Pipe Co.
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FOR SALE

1 Lima Shovel Model 604—Cummins Diesel Engine. This machine used only a few weeks. New condition. Priced to sell.

1 34E Rex Dual Drum Paver. Good operating condition. Will sell at reasonable price. Have discontinued business.

WALKER BROTHERS
36 HOOD STREET
CHAMBERSBURG, PA.

FOR SALE

One Buckeye Diesel Electric Generator Set, 2 cylinder, Horizontal, 240 RPM, Serial No. 9828, 190 H.P.—156 KVA, 3/60/2300, with transformer to reduce to 220 volts, Panel Board complete. Can demonstrate. Price $2,500.00.

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Skilled Right of Way men to appraise and negotiate for acquisition of right of way for State Highways, in the following classifications:

Right of Way Examiner I.....$3850-4815
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Immediate appointments may be made of qualified applicants on a temporary basis pending Merit System examination. Positions offer automatic increases in salary and liberal vacation, sick leave, and retirement benefits.

Applicants requested to submit complete record of education and previous right of way experience, with references, age and date available to:

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RIGHT OF WAY ENGINEER
Maryland State Roads Commission
108 E. Lexington Street
Baltimore 3, Maryland

FOR SALE

1—Truckman, Power-Lift Truck, excellent condition, $500.00
1—Stearns, 1 Bag Mixer with clutch and 5 horsepower motor, $400.00
1—Stearns, 12" Mold-Box, Complete with Extra Att., for solid Blocks, New Condition, $200.00
1400—12", 3 Core, Pressed Steel Pallets, 40% Air Space, Brand New, 75c each
1—Skip Loader, Complete With Motor, $300.00
1600—8" Solid Pallets, 20c each
400—4" Solid Pallets, 10c each
1—Pallet Dunker, $60.00
25—Steel Angle Iron Racks, 56 Block Capacity, $10.00 each
7—Steel Pipe Racks, $10.00 each
2,000—Modular Size 4" Pallets, Perfectly Clean, 25c each
2,000—Regular 4" Pallets, Perfectly Clean, 25c each
3—Lewis-Shepard, Rubber Tired 5,000 Pounds Hydraulic Lift Trucks, $165.00 each
5—Hand Operated Brick Machines, $65.00 each
1—Multiplex, Chimney Block Machine with 150 Cast Iron Pallets, $400.00
1—Kent Block Plant, includes, mixer conveyor block machine, $2,000.00

We have any size block plant you want.
Send for our Free List of Good Used Equipment.

General Engines Company
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Cable Address—Generenge, Phila.

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Did you say your transportation was impossible, too costly or just plain tough?

Before you throw up your hands call U.S.A.C. headquarters and let us check it over with you. If we don't handle it to your entire satisfaction, the best box of cigars in the house is on

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COMPLETE CRUSHING PLANT, used 1½ to 2 years—Byers ¾ yd. shovel, diesel—Le Roi 210 Compressor—Austin Western 25 x 40 Jaw and Feeder—Gruendler 4 XC Hammermill—Murphy ME 6 Power Unit—2 UD 18 Int. Power Unit—Cat. D3400 Power Unit—Front-end Loader Int. TD6—Cedar Rapids double-deck screen—Various other items making a complete plant, now operating—$80,000.00 cost when bought—Interested in selling entire plant as a unit.

McCOLLUM ROCK PRODUCTS, INC.
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FOR SALE

1—Lorain 40 Shovel with swamp cats. Good condition. Price, $8,000.00.

Ph. 21195 or Eve. 20423
DAN & SONS EXC. CO.
Warren, Ohio

FOR SALE

1 Barber-Greene Loader, Model 545—Reconditioned. Mounted on rubber.
1 D7 Caterpillar w/bulldozer
1 Cedar Rapids Jr. Tandem straight line crushing plant w/10x36 jaws—Reconditioned.
1 LS85 Link Belt Speeder dragline—45 boom, ¾ cy bucket and shovel front.

ELMER LARSON, INC.
Malta, Illinois

Used Diamond No. 65 Dual Crushing and Screening Plant

Consisting of 1036 Jaw, 3018 Roll, 48 x 10 D.D. Vibrator, 40 ft. x 24 inch Conveyor, D-13000 Caterpillar Power Unit. New in 1945 and in excellent condition.

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"WANTED TO BUY"

1—HD5G HI-LIFT
1—20 ton or over Low-boy Trailer. (Will Sell or Trade for larger Trailer) Martin 15 T. electric brakes

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A 9" x 14" Good-road Crusher, 12' bucket elevator powered by a Reo 40 HP unit. All mounted on skids. A 101A Stoner pulverizer, practically new with 18' enclosed bucket elevator, a 2' x 5' vibrator screen, a 65 HP Huber tractor, two 25-ton portable wood bins. Complete belts for all equipment. This is limestone equipment. This equipment is in A1 condition and is in operation at present. Price $3,000 complete.

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CATERPILLAR TRACTOR,
Model 30 PS Series w/side boom.
CATERPILLAR TRACTOR,
Model 20, PL Series w/end winch.
AUTO CAR 1943
Model U7144 w/Enclosed Cab.

BOILER TUBES
PIPE
GAS ENGINES
MACHINERY

BRADFORD SUPPLY COMPANY
WAYNE, Wood County, OHIO Near Toledo

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AT A RIGHT PRICE:

1—Sterling Diesel Tandem Tractor with a new H.B. 600 Cummings Motor. Tractor completely rebuilt two months ago by Sterling Motors.
1—90 Ton Rogers "I" Beam Trailer.
1—D3 1947 Ward La France Standard Tractor.
1—25 Ton 1947 Lilly Low-Boy Trailer with eight 825-15 tires.
1—D3 1947 Ward La France Tractor with 5 Speed Main Transmission, 3 Speed Auxiliary, Low Speed Timken rear end. 1200x20 tires.
1—1947 Fruehauf 50 Ton Low-Boy Drop Deck Trailer with 16-750x18 tires.
1—Rogers Low-Boy with 80 Ton Drop Deck. 750x18 tires.
1—Dorsey High-Trailer, Flat Deck, 35 feet long using 1100x24 tires.
1—25 ft. Fruehauf High Trailer, flat deck with 1100x24 tires.

WANTED:

1—Model 32 Hanson Shovel Front.

Write:

T. J. Kilmain Sales Co.
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or call Uniontown 5400

FOR SALE OR RENT

Complete Highway Paving Outfit: Paver, Finisher, Spreader, Forms, Bins, Roller, Subgrader, Form Tamper, Etc., Etc.

FOR SALE

Jaeger 16 EL Mixer, 310 C F Compressor, Rubber Tired Roller, Pumps, 2" to 12" 5 K.W. Light Plant, Lorain 40 with Shovel Dragline & Backhoe attachments.

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P&H Dragline, Model 1055LC—4 Cu. Yd., 90' boom, new May, 1948. Located Southern Illinois.

New International TD24 Tractor and Bucyrus-Erie Bulldozer. Located Southern Illinois.

CHERNUS CONSTRUCTION COMPANY
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DEPENDABLE USED MACHINES

Unit full rev. shovel, $1750
Angledozer on Cat 50
Link Belt 2½ yd. crane
24x40 port. belt conveyor
American 10" sump pump
Universal truck crane

TRACTOR & EQUIPMENT CO.
3521 W. 51st St. Chicago 32

We offer, subject to prior sale, the following concrete paving equipment for the lump sum of $20,000.00, located at our yard in Charlotte, N. C. It has just been painted and overhauled and has been used very little.

34-E Ransome Dual Drum Paver #12141
Jaeger Finisher 42x034
Koehring Finisher LF881
Form Grader—Galion
Butler Cement Bin (60 ton) and Elevator
One 50-ton Johnson Aggregate Bin
One R.B. Subgrader
One set Grade Logs

BROWN PAVING COMPANY
Box 484 Tel. 2423
LEXINGTON, N. C.

FOR SALE

3 Remanufactured EUCLID Model 9 FDT Bottom Dump 13 yard capacity earth haulers.

1 Remanufactured AUSTIN-WESTERN 10-ton three-wheel Autocrat roller with Buda engine.

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FOR SALE BY CONTRACTOR-OWNER

One—General Electric 150 H.P. Motor, 3 phase, 60 cyl. 220 volts, complete with starting compensator and entrance wiring, mounted on steel base with power take-off.
One—Acme Hollow center, scrubbing or scalping screen, 60 inches by 12 feet. Complete with electric drive.
One—Kennedy-Van Saun 2'x8' double deck vibrating screen. Complete with electric drive.
One—18"x60' Belt Conveyor.
One—18"x35' Belt Conveyor, complete with electric drive.
One—50 foot Bucket Elevator.
One—R-5 Caterpillar Bulldozer with LaPlante-Choate Angle Blade.
One—320 cu. ft. Sullivan Air Compressor, rubber mounted.
One—Byers Junior ⅜ cu. yd. Combination Shovel and Crane (Factory new).
One—Acme 3-wheel 5 ton Fine Grade Roller, with electric starter and scarifier.
6000' of 8x8 Road Forms.

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200 N. Main St. Herkimer, N. Y.

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1—Warco, Model V-35 I, Serial V 354566, Motor Oliver "35", #900290 M, year 1942, Tandem Drive Rebuilt 1948, Weight 17,000#, Hyd. Control, Electric Starter, Lights and Cab.

1—Galion, Model "G", Serial No. 15124A, Tandem Drive, Power Case Model LI #329980, Rebuilt 1948, Weight 19,000#, Hyd. Control, Electric Starter, Lights, Cab and Scarifier.

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POWER BUGGIES

Capacity 12 cu. ft. or 2,000 lbs. Hauls Concrete, Sand, Brick, etc. Speeds to 24 M.P.H. Used only 4 weeks on special job.

Will Demonstrate in N. Y. Area.

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1—Marion Model 342 1 yd. shovel with 60 ft. dragline boom and fairleads, crawler mounted, Caterpillar Diesel D-11000 Engine, 2½ yrs. old, used very little, is like new.

Several other good buys from ⅜ yd. to 1¼ yd. Shovels, Hoes, Cranes.

EUGENE P. READING, INC.

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FOR SALE

Cletrac BD 1946, front end loader, ¾ yd. bucket. Less than 1 year's use. A-1 condition. Will sell or trade. Make an offer.....$2800

20-ton Buckeye trailer, 8 wheels in line.....$1000

Phone Adams 4561

FLACK EQUIPMENT CO.

235 Broadway Toledo, Ohio

FOR SALE OR RENT

1—Lima Paymaster, combination shovel & backhoe.
1—Lorain Model 41, combination shovel backhoe & crane.
1—1½-yd. Osgood diesel shovel and crane.
1—1¾-yd. Lima, Model 750 diesel shovel and crane.
1—1¾-yd. Osgood diesel shovel.
1—Moto truck crane.
1—Scoop Mobile.
1—I-6 International diesel bulldozer blade with broom on rubber tires.
1—D-8 tractor with bulldozer.
1—D-7 tractor with bulldozer.
1—500' Worthington compressor diesel.
2—Worthington wagon drills.
1—Dust collector.
4—Rear End Euclid trucks.

TUCKAHOE CONSTRUCTION CO., INC.

116 Columbus Ave. Tuckahoe 7, N.Y.

1—TD 14 IHC tractor with 2 yard Hough loader; new May, 1948.

1—Sterling chain drive truck, 7½ ton.

1—GMC engine, 331 cu. inch, complete with starter, generator clutch and 5 speed transmission.

1—19,000 lb. double reduction rear axle, complete with 10 stud Budd wheels and hubs.

2—30 inch 5th wheels.

1—GMC 18 ft. trailer chassis with 10 stud wheels, 1000/20 tires.

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Phones 3720-8546 Waukesha, Wis.

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1 **TERRA COBRA,** complete over to oil tight housings. **$13,000.00**

1 **TERRA COBRA,** complete change over to oil tight housings **$13,000.00**

D8 Serial No. 1H7085 P.C.U. and PUSH BUMPER.....$8,000.00

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M. E. LIEN CONSTRUCTION CO.

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COMPLETE 1½ CU. YD. SAUERMAN SLACKLINE CABLEWAY

Two 1½ yd. Sauerman buckets
70 Ft. steel self-aligning mast
150 HP Thomas Hoist
220 V. 60 cycle 3 phase
1200 ft. 1½" track cable
Mast complete with all guy equipment

1400 FT. OF DOUBLE RR TRACK

With crossover—85 lb. steel

All equipment in excellent condition. Relocation of Federal Highway has made necessary the abandonment of gravel deposit.

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Truck and Equipment Bargains

1946 K85, INT. LWB platform.
1940 GMC 6x6 with Power logloader.
1937 Ford LWB Platform.
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1932 30-pass. Chevrolet bus.
18-ft. D-J Murray lumber trimmer.
No. 6 Howell Sawmill complete.
32-in. 3-saw Edger.
TD 6 INT. Cattractor with 8-ft. Angledozer like new.

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Face or finish your products with Sparkle-Crete.
Concrete and cement products faced with Sparkle-Crete are bringing TWICE the selling price of plain concrete and cement products.

Write for samples stating color desired.

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Heavy Duty Steel Trucks

Motorized Truck-Man For Sale

22—6" Channel Iron Frame, Gussetted, Castered Trucks. Some knocked down, some assembled. Also three brand new Truck-Man Motorized Hydraulic Lift-Trucks. Under-clearance suitable for above trucks.

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FOR SALE

12 Garwood "511" 8-11 yd. cable scrapers, 6 1400x20 tires, NEW WAR SURPLUS, repainted and new cable. More than $2000.00 less than current price, each.
1 Used Garwood "515" 12-15 yd. cable scraper, 1800x24 tires ..... $ 4000.00
2 Used LeTourneau "F" 12-15 yd. scrapers ..... 4000.00 ea.
1 D-8 Tractor, serial 1H4144, 8-R PCU, very good 12500.00
2 RD-8 tractors (converted to D-8), Let. 8-R PCU, with LeT. cable dozers, very good ..... 12000.00 ea.
1 Garwood Cable angle-dozer for HD-14 tractor 1000.00
2 "Low Boy" Trailers, 35-40 ton, tandem axles, 100x20 tires. NEW.... 3500.00 ea.
6 1400x24 20 ply tires and tubes, NEW 175.00 ea.
2 1400x24 16 ply tires and tubes, NEW 170.00 ea.
4 1300x20 12 ply tires and tubes, NEW 110.00 ea.
4 1200x20 12 ply tires and tubes, NEW 85.00 ea.

W. C. SCHNEIDER COMPANY, INC.
5641 Colfax Ave. So., Minneapolis 19, Minn.
Telephone: Regent 6713

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1—3-yd. Jaeger mixer, mounted on 1938 White truck—$2,000.00.
1—1½-yd. Jaeger mixer, mounted on 1941 Ford truck—$1,500.00.
2—1½-yd. Jaeger mixers, mounted on 1947 Dodge trucks—$2,500.00 each.
1—Rex concrete mixer, 3 bag capacity. LeRoi motor—$1,100.00.

All the above in excellent condition.

Kaysner Construction Co.
711 W. Spruce St.
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WANTED

Rotary kilns: Size 11′, 10′, 9′, 8′, 7′ and 6′ dia. 100′ or longer.
Compeb mills: 6′ and 7′ dia.
Tube mills: 5′, 6′ and 7′ dia.
Jaw crusher: 7″ x 9″.
Ball mills: 7′ in diameter or larger and 8′ in length or longer.
Slurry filters, drum or disc type.
Steel tanks 14′ in dia. x 12′ to 25′ or longer with ¼″ or ⅜″ plate.
Bradley Junior Pulverizer.

OLLIE E. LAWRENCE
BOX 688
QUINCY, MICHIGAN

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Austin-Western 21 x 38" roller bearing jaw crusher mounted on trucks with 3 x 8′ Austin-Western feeder & 115 HP Waukesha gas power unit, 6 V-belt drive. Weight 60,000#. Pr. $8000.00
Williams 36 x 60" ball bearing hammermill, mounted but less wheels, w/M-M 8 x 9 gas power unit, 210 HP, 12 V-belt drive..... $8000.00
30 KW "Caterpillar" diesel generator, D-4600, 110/220 or 440 v w/automatic switches. Like new $3000.00
3 x 8′ Austin-Western feeder. Only 3 mos. service. $1500.00
5 x 12′ Seco screen, like new..... $1800.00
22′ Heavy Barber-Greene bucket conveyor—18" buckets, nearly new..... $1200.00
25′ Bucket Conveyor, 20" belt, 18" bucket, totally enclosed, upright..... $1000.00
30′ Bucket Conveyor, 20" belt, 18" bucket, totally enclosed, upright, nearly new..... $1200.00
410′ of Submarine Cable, 2300 V, lead covered and armored. Brand new—Bargain..... $1000.00
4—GMC Dump Trucks, rock beds, 1942. Good shape. Each $1000.00
12—42" Troughing Roller Assemblies. Brand New $277.00
4—42" Return Troughing roller Assemblies. Brand new. $51.00

All Prices F.O.B. Lincoln, Ill.

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Allis-Chalmers HD10W bulldozer with Baker blade. 18 months old and in A-1 condition.

NEW Allis-Chalmers HD7W with Gar Wood blade.

Both units are working

GARDNER BROTHERS
Ridgefarm Illinois

FOR SALE

1—CEDARAPIDS UNITIZED CRUSHING PLANT
1—Bucyrus-Erie 120-B steam shovel, 5-yard
2—Bucyrus-Erie 50-B steam shovels, 1¾-yard
1—General Motors Twin power diesel unit, Model 12103
2—Allis-Chalmers Synchronous motors, 150 H.P., 360 R.P.M.

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"Caterpillar" D6 & Blade
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10B Bucyrus-Erie Crane, Hoe and Dipper Stick
"Quick-Way" Truck Crane
99-Austin-Western Grader
Low Boy Trailers, 45-ton, 20-ton
Fruehauf Semi-Tank, 3000 Gal.

JOHN FLEMMING
1101 S. Dort Hwy. Flint 7, Michigan
Phone 49442

FOR SALE

1¾ yd. Lima 701 crane-shovel-dragline. Superior diesel, overhauled. 60 ft. bm. Bargain.

1½ yd. Lima 601 Crane-shovel-dragline. Caterpillar D-13000 engine. 70 ft. bm. Excellent shape.

25 ton Wiley steel stiffleg derrick. 60 ft. bm., 30 ft. mast. Condition new.

Steel Sheet, Piling & Pile Hammers Bought, Sold & Rented

Mississippi Valley Equipment Co.
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FOR SALE

2—DW 10's with LaPlant scoops—good condition.
1—D 7 tractor, cable dozer—good condition.
1—R D 7 Tractor—Hydr. Dozer—good condition.
2—Super C Pulls—fair condition.
2—C type Pulls—Completely rebuilt.
1—Tournadozer, near new—A1 condition.
1—HD 14 Tractor & Garwood Scoop Hyrd.

All priced cheap for quick sale

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Council Bluffs, Iowa

1918 1949

CONSTRUCTION EQUIPMENT

New and Used

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Ingersoll-Rand Air Compressors, Tools
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Rex Chain Belt Truck Mixers, Pumps and Pumpcrete Machines
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4′x16′ Open end tube mills (3)
Air compressors
All steel dredge boats, scows, tug boats and pug boats
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QUINCY, MICHIGAN

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1—Used Allis-Chalmers Model WM tractor equipped with Hough loader
1—Used Model L tractor with Baker bulldozer.
1—Rebuilt Model HD10W tractor with Baker bulldozer
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1—Used "Caterpillar" RD6 tractor
1—1947 White 20 truck w/ grain semi-trailer
1—12' Adams grader
1—"Caterpillar" 33 grader
1—M & M Model UT1 tractor w/ dual tires
1—New 4' Titan chain saw—$450.00
1—New Moorhead portable sand drier —$1325.00
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1—Used Link-Belt Model 50 Shovel
1—Used trench hoe for Buckeye Model 70 Clipper
1—Used Allis-Chalmers Model HD 14 tractor w/cable angledozer
1—Used LeTourneau Model J8 scraper
1—Used Buckeye Model 70 dragline and shovel
1—Used Allis-Chalmers Model E-60 power unit
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1—New Kwik-Mix 6-S concrete mixer
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1—Novo traffic line marker
1—New Novo standard pavement breaker
1—New Kwik-Mix 3½-S end discharge concrete mixer
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Various size pumps, gas engines, rotary scrapers, and slip scrapers
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1—150 ton ph, Cedarapids washing plant—complete with 220 volts, 3 Ph electric drive motors. Including 18"x80', 18"x197', 18"x 340' triple deck conveyor. Also 24"x90' feed conveyor with 10 yd. feed hopper.
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1—100 ton, 3 compt. Butler bin.
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1—3'x8' double deck screen.
1—4'x14' triple deck screen.
1—40 HP 220, 3 PH 900 rpm electric motor with starting switch.
1—LeRoi, RA-4, 95 HP gas engine unit (clutch and outboard bearing).
1—8" Superior McCully crusher.

GURZICK SUPPLY CO.
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New repair parts for International trucks Model A5 & A6, including axle shafts, double reduction rear axle parts, etc. Also three differential carriers for C-50. Axle shafts for C50 & C835. Will sell at sacrifice.

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One 1½ yd. Lima Type 602 Shovel and dragline.
One 1¼ yd. Northwest Shovel.
One ½ yd. Byers Shovel.
Two LeTourneau Model RU Scrapers.
One LeTourneau Model FP Scraper.
One LaPlant-Choate Model C-84 Scraper.
One Caterpillar D8 Tractor.

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FOR SALE

1—New Galion Tandem Motor Grader, 76 h.p.

Used Equipment

1—TD6 w/Bucyrus-Erie ¾ yd. high lift.
2—I-30 Galion motor graders, dual wheels. Good condition.
1—Allis-Chalmers, 8', hand controlled pull grader.
1—"Quick-Way" truck crane, ½ yd., mounted on FWD truck, new in 1946, 30' boom and drag bucket.
1—Backhoe attachment for "Quick-Way" Model E machine. Same as new.
1—¾ yd. Hendricks dragline bucket. Excellent condition.
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Phone 5104

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1—Caterpillar D7 with Le Tourneau Cable Dozer
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1—Northwest Crane 1¼ yd. Model 104
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All Equipment in Good Working Condition

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Huber 10 ton 3 wheel roller
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P & H ¾ cu. dragline
P & H 1 cu. yd. dragline
P & H 1¼ cu. yd. dragline
IHC Model TD6 w/bulldozer
"Quick-Way" dragline
IHC T6 w/bullgrader
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Cletrac Model BGS w/Heil dozer & Winch
Shovel front attachment for B-E 10B

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"Caterpillar" D7 hi lift & loader, 3T Series
Repair parts for GI Trucks
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New C-108 LaPlant scoop. Bargain
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1—N. W. Shovel, 2½ c.y., new Oct. 1946
1—N. W. Shovel, 1½ c.y., new April 1946
1—P & H Dragline, 1½ c.y., new June 1948
1—N. W. Shovel, ¾ c.y., Diesel, Backhoe—40' Crane, Dragline, new Aug. 1948
1—Allis Chalmers Tractor Model HD19H, new May 1948
5—D W 10's—used 2500 hours
1—Caterpillar Auto Patrol #12—9K4626
1—Caterpillar D8 Angledozer #8R8933
1—Caterpillar D7 Bulldozer 4T5988

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Box 145, Middle River, Baltimore 20, Md.
Phone: Essex 1310

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2000 GAL. TANK SEMI TRAILERS AT $850 PER UNIT

IDEAL FOR PORTABLE STORAGE

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DUAL WHEELS — HEAVY DUTY 9:00 x 20 TIRES
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USED ONE SEASON

available for inspection and immediate delivery

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Winslow 3 beam wheelbarrow scale with 2-50 lb. test weights	$ 140.00
Ford tractor with hydraulic front end loader also plow. Same as new	1,650.00
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2—Tool box trailers, one open, one closed, both on pneumatics. Each	75.00
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2—Caterpillar "60" tractors. Good condition. As is, Each	1,000.00

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GM Model 471, 4 cyl., 100 H.P., Diesel Power Unit with Electric Starter, battery and fuel tank.

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Used on one job as stationary mixer. Perfect condition. Less than half price.

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MODEL 855 LC powered with Caterpillar D17000 engine, recently overhauled by Caterpillar dealer. Equipped with special boom usable at 60 ft. 70 ft. 80 ft. or 90 ft. Also 2 cu.yd. bucket and $700.00 in spare parts. Machine will handle 3 cu.yd. bucket at 60 ft. boom, 2 cu.yd. at 90 ft. boom. Available immediately, located Northern Michigan.

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ST. IGNACE, MICH.

FOR SALE

(2)—Truck Mixers—4½ yard Hi-discharge—Bought new May 1947—Rex make
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(3)—Truck Mixers—5½ yard horizontal type—Bought new Jan. 1943—Rex make
6 Cylinder Wisconsin Engine, Serial # 1115, Type "E" 6x7.
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FOR SALE

1 1-yard Page Dragline Bucket like new, $300
1 RD 7 Caterpillar with LeTourneau Angledozed and PCU
2 NEW Lessman ¾ yd. front end loader. These are a buy at less than factory cost.

We also have a large assortment of spare Caterpillar and International parts for most sizes of tractors.

TRI-STATE EQUIPMENT CO., INC.
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1—Austin Power Pickup Sweeper, 7'0"x3' rear broom, 42" gutter broom, pneumatic tires, sprinkler system. (Re-built.) $1,500.00.

CASEY & EMMERT, INC.
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FOR SALE

2—3-yd. Hi-Discharge Truck Mixers, on Int. Trucks.
2—D4 Cat. W/Traxcavators, 1-yd. Bkts. (one new).
1—Model "C" Tournadozer (New), less than 100 hrs.
1—New Truck Crane, Have Magnet Setup if desired, or Hoe Attachment. "Real Buy."
1—Late model Universal 880 Portable Gravel Plant D8800 Cat. power. A1 Condition.
1—Late model Universal Washing Plant (Portable).
1—TD6 Int. W/B-E ¾ yd. Hyd. Loader (2 yrs. old) $3500.

BOYLE-CARLSON CO.
708 Paris Ave. Rockford, Ill.
Phones—Dial 4-1336 or 3-2142

FOR SALE

TD18 International wide gauge with Bucyrus-Erie cable dozer, Bucyrus-Erie double drum P-29 heavy duty winch. New, Oct. 1948. Only 200 hours, $1,500 below cost.

HAROLD D. DRUCK
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Phone: Blue 411

FOR SALE

Two TD-9 International tractors with Bucyrus-Erie hydraulic angle dozers, one equipped with Carco logging winch.

Two T-9 International tractors with Bucyrus-Erie hydraulic angle dozers, one equipped with Gar Wood winch with two nigger heads.

These tractors are equipped complete and are in unused condition same as new. Now on display at our lot.

Also can deliver in 30 days most types of construction equipment.

SECURITY EQUIPMENT CO.
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"Osgood" Model 200, ½ yd. shovel, crane and dragline, with clam bucket. Excellent condition. Used approximately 18 months.

"General Invincible" ¾ yd. chain crowd, shovel, crane and dragline. Retract, crowd and shovel front new in 1948.

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New Equipment

Diamond 32 x 27 Hammermill, throat opening 6 x 28, stone size 6", weight 11,200 pounds, capacity ⅛" Ag. Lime 40 tons per hour.

Diamond rigid type bucket elevator, 27 ft centers, 10" x 6" x 7¾" buckets on belt, continuous type, discharge head, loading hopper and 7' steel chute.

Garwood Model T-5RB rear end single drum winch for IHC TD-18

M-R-S Wagon with IHC ID-9 Tractor

Used Equipment

Two IHC TD-9's with Bucyrus-Erie Loaders
Two IHC TD-14's with Heil cable dozers
TD-9 IHC with Heil cable dozer
Bucyrus-Erie 10B Shovel Rebuilt, Like new.
Wayne Crane Backhoe Four Wheel Drive,
All Duals Hydraulic Steering
Two Model HS Hough Payloaders
Austin-Western 10' Pullgrader
Conveyor 14' x 18" with 2HP Electric Motor
Heil 3½ yd. Cable Scraper almost new.

A. E. HUDSON COMPANY

East Peoria, Ill. Phone 4-9142
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FOR SALE

1—315 cu. ft. 2 stage Ingersoll-Rand air compressor on truck.
1—Allis-Chalmers Model M tractor with bulldozer.
1—Allis-Chalmers Model K tractor with bulldozer.
1—Allis-Chalmers Model L tractor with bulldozer.
1—Bros sheepsfoot roller.
1—2 yd. Euclid tumble bug.

EDWARD KRAEMER & SONS
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CRUSHERS, ETC.

1—18" x 36" Farrel—Type "B" Crusher—Not Rebuilt
1—No. 4½ Champion (No. 10 Beaumont) Jaw Crusher, 10" x 20" opening.
2—No. 4 Champion Jaw Crushers, 9" x 15" opening.
2—No. 6 Traylor Gyratory Crushers with T.Z. head.
1—No. 4½ Traylor Gyratory Crusher.
1—Jeffrey Swing Hammer Mill, Type A, 24" x 18".
1—Jeffrey Swing Hammer Mill, Type A, 30" x 24".
1—18" LINK-BELT APRON CONVEYOR—9" pitch, 27' centers, like new.
1—6" Morris Sand Pump, D. C. to gasoline engine.
1—6" Morris Sand Pump with coupling on bed for motor mount.

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Late Model "Caterpillar" D4 tractor and traxcavator, Ser. #5T2604W, complete with ¾ yd. digging bucket, 1 yd. material handling bucket, bulldozer blade and spare parts. Has operated 2800 hrs. In first class condition, priced right.

FLOYD STAUB
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FOR SALE

1 Austin-Western medium duty motor patrol in A-1 condition complete with scarifier, $750.00.
1 Winslow 2 compartment bin with 1 yd. trolley batcher.
2 1948 model ¾ yd. cap. Shovels. Full swing. 1 truck mounted and 1 crawler mounted with all attachments.
1 1947 model Byers Junior Shovel.
1 Bucket elevator 12' long, complete except for power, $250.00.

SERVICE CONSTRUCTION & EQUIP. CO.
6335 Manchester Avenue
St. Louis 10, Missouri Tel. Sterling 7078

FOR SALE

1—Caterpillar D-7, Serial No. 7M-170SP, Hour Meter Reading since completely reconditioned 1739, equipped with LeTourneau Dbl. Drum P.C.U. and a LeTourneau Angle Dozer, with a Wooldridge BBU Carryall Scraper, equipped with 1800x24 tires. Scraper has been used about 75 days. Priced as a unit $14,000.00

1—Adams 412 H Motor Grader, Serial No. 2995, Hour Meter Reading less than 800 Hours. Priced at....$7,000.00

1—Adams Model 11 Elevating Grader, 19 ft. Carrier, Int. 6 cylinder Gas Motor, near new condition, priced without belt at.....$2,250.00

1—Buckeye Wheel Type Trenching Machine with 5½ ft. by 26 inch wheel. Good Mechanical Condition. Priced at $1,500.00

1—General Heavy Duty ¾ yd. Dragline, equipped with 35 ft. of boom, also one 10 and one 15 ft. boom extension, equipped with a 5 kw LeRoi Light Plant and a 1 cu. yd. light weight Page Dragline Bucket. This machine is in excellent condition. Priced at $6,500.00

2—Brand new Model TS ¾ yd. Hendrix Dragline Buckets. Priced at.....$500.00 ea.

1—Slightly used LeRoi 5 kw Light Plant $325.00

1—Gar Wood Hydraulic Unit for AC HD-7 Cat, used but good. Priced at $175.00

1—Gar Wood Model 400 Carryall Scraper with Model 400 Control Unit. Condition Very Good.....$2,500.00

1—AC Model L Tractor, Condition Very Good, with special low Transmission..$2,850.00

1—Sauerman ½ yd. Bucket, like new $125.00

1—1946 Int. ½ ton Pick-up, Condition good.....$1,000.00

1—Int. DR50 Tractor with IHC 361 inch Red Diamond Motor, F54C Transmission, 1000x20 tires, equipped with Model 30 Tulsa Winch, and 25 ton Tandem Axle Lowboy Trailer, Equipped with 8 900x15 tires.....$4,250.00

1—John Deere Heavy Duty Grub Plow, Like New, 24 inch $450.00

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10—General Motors Model 6-71 Diesel Power Units, radiator cooling, electric starter, clutch, power takeoff, completely rebuilt and carry same guarantees as new engines. Will furnish expert mechanic to start and instruct your operators.

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3 MANITOWOC CRANES

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3—Jaques Power Saws, Tractor Mounted—1 for International Tractor, 2 for Ford Tractor. Price each $600.00

3—Used Highway Model C Earth Boring Machines, each.....$500.00 Limited amount of parts for Highway C Machines in stock. Large stock of parts for Highway H.D. Models in stock. 25% discount to dealers.

2—Good used Jaques Hydraulic Control Earth Boring Machines—Reconditioned Power Plant V-8, 100 H.P. Motor. Price each F.O.B. Forty Fort, Penna.....$2,500.00

We service and sell Jaques Hydraulic Control Earth Boring Machines in 21 States and Canada

WYOMING VALLEY EQUIPMENT COMPANY

1089 Wyoming Avenue

Forty Fort Wilkes-Barre, Penna.

Phone 7-6400

FOR SALE

Byers Model 71W Traveler as a shovel, and 30' boom, Page ½ yd. Dragline Bucket, Kiesler ⅝ clam, Fairleads and Tagline. In excellent condition. Will sell at large sacrifice.

Portable Cedar Rapids Used Crushing Plant; complete with motor.

TD-14 International Tractor with crank case guard, electric lights, hydraulic angle dozer, like new, worked 230 hours.

Write or call

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1—**Adnum Paver** complete with 50 H.P. Hercules engine, A-1 shape, price f.o.b. St. Paul, Minnesota —**$5,000.00.**

1—**Jaeger type H Deluxe Finisher,** 20-24 ft.—used one month, f.o.b. St. Paul, Minnesota—**$5,000.00.**

1—**Hendrix 1-yard Dragline Bucket** complete, f.o.b. Minneapolis, Minnesota—**$350.00.**

1—**Williams 1-yard material clam shell bucket,** perfect condition, price—**$500.00.**

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Must be capable of Designing Sewers from field notes. $5,200 a year. Also need good detail draftsman.

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USED DRAGLINES, SHOVELS, CRANES, AND BACK HOES

½, ⅝, ¾ and 1 cu. yd. sizes

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One LFM-12-½ Cleaver-Brooks heavy oil steam generator with all necessary assembly and control parts, including LeRoi engine.

One Model 837 single drum dryer with 7 ft.x20 ft. drum, semi-trailer mounting, pneumatic tires, complete with Buda engine, etc.

One 10 ft. Model 879A finisher complete with power hoist, engine, etc.

This equipment can be inspected at the Sheboygan County highway repair shop, has been used only one year, and is good as new.

SHEBOYGAN COUNTY HIGHWAY COMMISSION, Anthony C. Droppers, Sheboygan, Wis., Commissioner.

FOR SALE or RENT

Rebuilt Equipment—Excellent Condition

2—Caterpillar D4 with Traxavator	$ 6,000.00	1—Model M LeTourneau Scraper	$ 2,750.00
5—#25 Thor Paving Breakers	200.00	1—HD10 Allis-Chalmers with Dozer	5,000.00
2—#99 Austin Western Power Graders	2,500.00	1—D8 Caterpillar Tractor No. 8R9061 with LeTourneau Angledozer	15,750.00
1—#51 Adams Motor Grader	2,500.00	1—HG42 Cletrac with Bulldozer	2,300.00
1—#11 Caterpillar Motor Grader	2,200.00	1—ADH Cletrac with Bulldozer	3,750.00
1—#311 Adams Motor Grader	4,000.00	1—TD18 International with Angledozer	8,750.00
1—#33 Caterpillar Pull Grader	850.00	1—Bucyrus-Erie S-90 Scraper	3,500.00
1—#104 Adams Pull Grader	1,000.00	1—Gorman Rupp 5"x6" Wellpoint Pump	700.00
1—3 Drum Sheep Foot Roller	800.00	1—ID9 International Wheel Tractor	3,250.00
1—2 Drum Sheep Foot Roller	350.00		
1—Austin Western 3 Wheel Roller	2,100.00		
1—Model D LeTourneau Scraper	1,500.00		
1—Model LS LeTourneau Scraper	3,900.00		

WATKINS-ALDRIDGE EQUIPMENT CO.
912 South State St. Dial 3-2451 Jackson, Mississippi

EMMETT C. WATSON CO.

Contractors Equipment

Lima Type 603 Shovel, 1½ cu. yd. bucket; Waukesha-Hesselman Motor; Crane Boom; S/N 1076.

Northwest Model 6 Shovel; 1½ cu. yd. bucket; 25' boom; 18' stick; 1500 W Kohler light plant; D-13000 Caterpillar diesel engine. S/N 8975-6751B.

Caterpillar D8 Tractor with P.C.U. & Blade; S/N 8R185 (LeTourneau Angle Blade).

Caterpillar D8 Tractor with P.C.U. & Blade; S/N 8R8946 (LeTourneau Angle Blade).

Caterpillar D8 Tractor with P.C.U. & Blade; S/N 1H5734SP (LeTourneau Angle Blade).

Caterpillar Model 12 Motor Patrol Grader; S/N 8T863. Used very little.

1—D 13,000 Caterpillar Diesel Engine completely overhauled in new condition with Automatic Group. $4,500.

Northwest Model 80-D Dragline; 3 cu. yd. bucket; S/N 8566.

Northwest Model 8 Dragline; 3 cu. yd. bucket; S/N 6254.

Northwest Model 5 Shovel; heavy duty type; 1½ cu. yd. diper; 50' boom; gantry; fairleads; 1½ cu. yd. Hendrix bucket; New cab and new paint; S/N 4589. Price $17,500.00.

Location: Eastern Kentucky—Condition: Excellent. Prices on application. Subject to prior sales.

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Phone: CAlhoun 5373
SALES—SERVICE

FOR SALE

CONTACT

John H. Frisinger, Inc.
612 Ann Arbor Trust Building
Telephone 8740
ANN ARBOR MICHIGAN

NEW—TOURNAPULL, Model C-1, with Power Control Unit, with Tournatrailer, Model 210.

NEW—TOURNAPULL, Model Q, with bulldozer, with Model D scraper.

NEW—DRAGLINE and Clamshell buckets all popular makes, sizes from ½ cubic yard to 2½ cubic yards.

NEW—INTERNATIONAL K-11.

USED—D-8 Caterpillar Tractor, with Hyster Hoist, with Angledozer like new.

USED—HUBER, 10-ton roller, Caterpillar Diesel D-4400 engine driven three-wheel.

For Sale

1942 I.H.C. KR11 truck tractor, with 1946, 150-h.p. Cummins engine, air brakes, electric sanders, saddle tanks and new fifth wheel. This truck is in first class shape and will make the party who needs such a heavy tractor a good deal.

Also 1-HD Allis Chalmers crawler Tractor with drott Hydrolic Bull Angle Dozer. This Tractor has 2500 hrs. and is practically like new. Was priced to sell at $9,000. Can be seen in the field at work.

VICTOR SCHILLER
2581 13th St., Monroe, Wis.
Phone 1629

FOR SALE

1—TD9 International Tractor w/Bucyrus Bull Grader
1—T6 International Tractor w/Bucyrus Bulldozer
1—Lorain ½ yd. Shovel & Backhoe
1—Insley Shovel/Backhoe Combination
1—10 Yard Woolridge Scraper
1—3 wheel 7 ton roller

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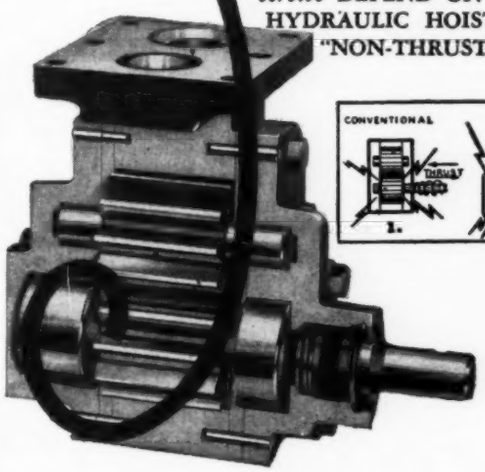

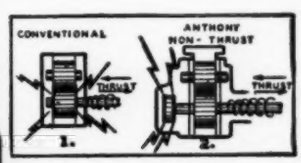

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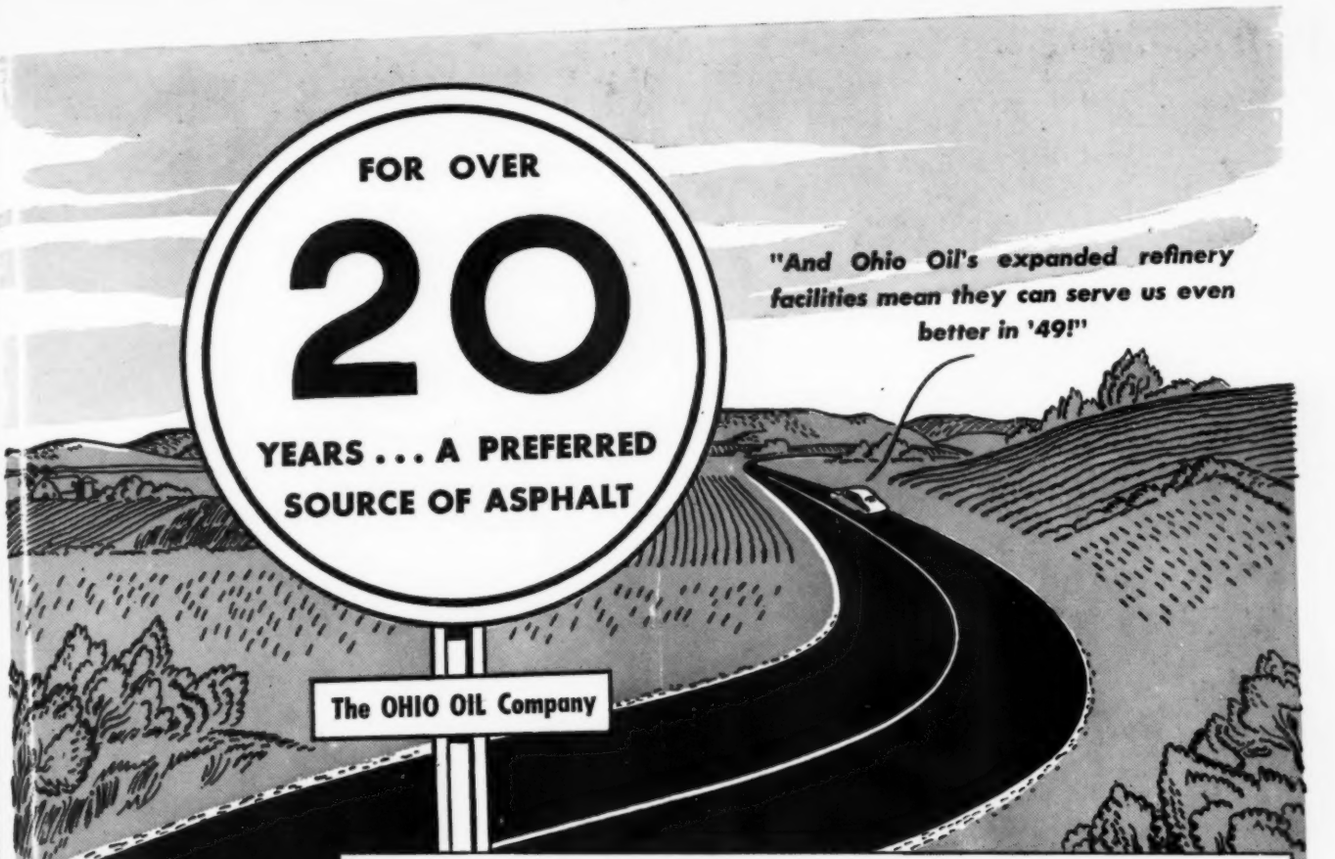
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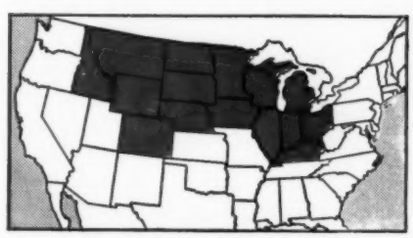

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